

32

41694
Smith
86

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY,

INCLUDING

ZOOLOGY, BOTANY, AND GEOLOGY.

(BEING A CONTINUATION OF THE 'ANNALS' COMBINED WITH LOUDON AND
CHARLESWORTH'S 'MAGAZINE OF NATURAL HISTORY.')

CONDUCTED BY

ALBERT C. L. G. GÜNTHER, M.A., M.D., Ph.D., F.R.S.,
WILLIAM CARRUTHERS, Ph.D., F.R.S., F.L.S., F.G.S.,

AND

WILLIAM FRANCIS, F.L.S.

VOL. V.—EIGHTH SERIES.



LONDON:

PRINTED AND PUBLISHED BY TAYLOR AND FRANCIS.

SOLD BY SIMPKIN, MARSHALL, HAMILTON, KENT, AND CO., LD.;
BALLIÈRE, PARIS: HODGES, FIGGIS, AND CO., DUBLIN:
AND ASHER, BERLIN.

1910.

"Omnes res creatæ sunt divinæ sapientiæ et potentiæ testes, divitiæ felicitatis humanæ:—ex harum usu *bonitas* Creatoris; ex pulchritudine *sapientia* Domini; ex œconomiâ in conservatione, proportionone, renovatione, *potentia* majestatis elucet. Earum itaque indagatio ab hominibus sibi relictis semper æstimata; à verè eruditis et sapientibus semper exulta; malè doctis et barbaris semper inimica fuit."—LINNÆUS.

"Quel que soit le principe de la vie animale, il ne faut qu'ouvrir les yeux pour voir qu'elle est le chef-d'œuvre de la Toute-puissance, et le but auquel se rapportent toutes ses opérations."—BRUCKNER, *Théorie du Système Animal*, Leyden, 1767.

. The sylvan powers
 Obey our summons; from their deepest dells
 The Dryads come, and throw their garlands wild
 And odorous branches at our feet; the Nymphs
 That press with nimble step the mountain-thyme
 And purple heath-flower come not empty-handed,
 But scatter round ten thousand forms minute
 Of velvet moss or lichen, torn from rock
 Or rifted oak or cavern deep: the Naiads too
 Quit their loved native stream, from whose smooth face
 They crop the lily, and each sedge and rush
 That drinks the rippling tide: the frozen poles,
 Where peril waits the bold adventurer's tread,
 The burning sands of Borneo and Cayenne,
 All, all to us unlock their secret stores
 And pay their cheerful tribute.

J. TAYLOR, *Norwich*, 1818.



CONTENTS OF VOL. V.

[EIGHTH SERIES.]

NUMBER 25.

	Page
I. On some Permo-Carboniferous Fishes from Madagascar. By A. SMITH WOODWARD, LL.D., F.R.S., of the British Museum. (Plate I. figs. 1-5.)	1
II. Notes on some Upper Palæozoic Shells from Madagascar. By R. BULLEN NEWTON, F.G.S., of the British Museum. (Plate I. figs. 6-11.)	6
III. Descriptions of Oriental <i>Capsidæ</i> . By W. L. DISTANT	10
IV. Descriptions and Records of Bees.—XXIV. By T. D. A. COCKERELL, University of Colorado	22
V. New Species of <i>Diploptera</i> in the Collection of the British Museum. By GEOFFREY MEADE-WALDO, B.A.	30
VI. Notes on Crustacea found in the Gizzard of a Deep-sea Cephalopod. By THOMAS SCOTT, LL.D., F.L.S. (Plates II. & III.)	51
VII. Notes on <i>Cleridæ</i> and Descriptions of some new Genera and Species of this Family of Coleoptera. By CHARLES J. GAHAN, M.A., of the British Museum (Nat. Hist.)	55
VIII. Descriptions of new Species of Monkeys of the Genera <i>Galago</i> , <i>Cebus</i> , <i>Alouatta</i> , and <i>Cercopithecus</i> . By D. G. ELLIOT, D.Sc., F.R.S.E., &c.	77
IX. New African Mammals. By OLDFIELD THOMAS	83
X. New African Mammals. By GUY DOLLMAN, B.A.	92
XI. Preliminary Description of a new Genus of Epomophorine Bats. By KNUD ANDERSEN	97
XII. On some Species of the Genus <i>Epomops</i> . By KNUD ANDERSEN	99
XIII. New African Mammals of the Genera <i>Cricetomys</i> and <i>Pro-cavia</i> . By R. C. WROUGHTON	106

	Page
XIV. Diagnoses of new Species of Marine and Freshwater Shells from the Falkland Islands, including Descriptions of Two new Genera of Marine Pelecypoda. By J. E. COOPER and H. B. PRESTON, F.Z.S. (Plate IV.)	110
XV. A new Indian Species of <i>Musca</i> . By ERNEST E. AUSTEN.	114
XVI. On some Points in the Nomenclature of Echinoids. By Dr. TH. MORTENSEN	117
<i>New Books</i> :—A Treatise in Zoology. Edited by Sir RAY LANKESTER, K.C.B., M.A., LL.D., F.R.S. (1) Part VII. Appendiculata: Third Fascicle. Crustacea. By W. T. CALMAN, D.Sc. (2) Part I. Introduction and Protozoa: First Fascicle. By S. J. HICKSON, F.R.S., J. J. LISTER, F.R.S., F. W. GAMBLE, D.Sc., F.R.S., A. WILLEY, M.A., D.Sc., F.R.S., H. M. WOODCOCK, D.Sc., the late W. F. R. WELDON, F.R.S., and E. RAY LANKESTER, K.C.B., F.R.S.—Hull Museum Publications. No. 63. A Descriptive Catalogue of the Dobrée Collection of European Noctuæ. Compiled by HORACE B. BROWNE, M.A., Assistant Master at Hymsers College, Hull	
	125—127
Proceedings of the Geological Society	128, 129
RICHARD BOWDLER SHARPE, LL.D.; on the Dates of Publication of Costa's 'Fauna del Regno di Napoli,' 1829-1886	130—132

NUMBER 26.

XVII. Descriptions and Records of Bees.—XXV. By T. D. A. COCKERELL, University of Colorado	133
XVIII. Some undescribed <i>Gerrinae</i> . By W. L. DISTANT	140
XIX. On the Lamellicorn Beetles of the Genus <i>Peltonotus</i> , with Descriptions of Four new Species. By GILBERT J. ARROW	153
XX. Crustacea collected by the late Mr. R. L. Ascroft and Mr. Harvey in the North of the Bay of Biscay. By ALFRED O. WALKER, F.L.S., F.Z.S.	158
XXI. On some new Species of Silver-Pheasants. By EUGENE W. OATES	162
XXII. On the Wallabies usually referred to <i>Macropus agilis</i> , Gould. By ERNST SCHWARZ	164
XXIII. New <i>Pterasteridae</i> from the North Pacific. By WALTER K. FISHER, Stanford University, California	167
XXIV. New Genera of Starfishes. By WALTER K. FISHER, Stanford University, California	171
XXV. On a Collection of Mammals made by Mr. S. A. Neave, during his Expedition in Northern Rhodesia. By GUY DOLLMAN.	173

	Page
XXVI. On Two new Species of Wood-boring Crustacea from Christmas Island. By W. T. CALMAN, D.Sc. (Plate V.)	181
XXVII. Notes on the Choanoflagellate Genera <i>Salpingæca</i> and <i>Polyæca</i> , with Description of <i>Polyæca dumosa</i> , sp. n. By J. S. DUNKERLY, B.Sc., Assistant in Zoology Department, Birkbeck College, London. (Plates VI. & VII.)	186
XXVIII. Further new African Mammals. By OLDFIELD THOMAS.	191
XXIX. Descriptions of new Forms of <i>Cercopithecus</i> and <i>Graphiurus</i> from British East Africa. By GUY DOLLMAN, B.A.	202
XXX. Some Servals and an <i>Otomys</i> from East Africa. By R. C. WROUGHTON	205
XXXI. On Hexactinellid Sponge Spicules and their Names. By R. KIRKPATRICK. (Plate VIII.)	208
Proceedings of the Geological Society	214
RICHARD B. SHARPE, LL.D.; on the Nomenclature of Echinoderms, by F. A. Bather; Note on the Occurrence of <i>Hippolyte gracilis</i> (Heller) in the British Area, by A. O. Walker, F.L.S., F.Z.S.	215, 216

NUMBER 27.

XXXII. Some Notes on the Life-history and Rate of Growth in <i>Gobius minutus</i> . By EDWARD SHANN, B.Sc., Gatty Marine Laboratory, St. Andrews. (Plates IX. & X.)	217
XXXIII. A Collection of Mammals from Eastern Buenos Ayres, with Descriptions of related new Mammals from other Localities. By OLDFIELD THOMAS	239
XXXIV. Remarks on Prof. L. von Méhely's recent Contribution to the Knowledge of the Lizards allied to <i>Lacerta muralis</i> . By G. A. BOULENGER, F.R.S.	247
XXXV. Descriptions and Records of Bees.—XXVI. By T. D. A. COCKERELL, University of Colorado	256
XXXVI. On new Species of West-African <i>Culicidæ</i> . By Dr. W. M. GRAHAM	264
XXXVII. Two new Duikers related to <i>Cephalophus abyssinicus</i> and a new <i>Dendromus</i> from Mt. Elgon. By R. C. WROUGHTON	273
XXXVIII. Eight new African Rodents. By WILFRED H. OSGOOD	276
XXXIX. Further new African Mammalia. By OLDFIELD THOMAS.	282
XL. Two new Species of African Dormice belonging to the Genus <i>Graphiurus</i> . By GUY DOLLMAN, B.A.	285
XLI. Further Notes on <i>Merlia normani</i> , Kirkp. By R. KIRKPATRICK	288

	Page
XLII. Description of a new Species and a new Subspecies of European Bats. By G. E. H. BARRETT-HAMILTON	291
<i>New Book</i> :—Third Annual Report of the Committee of Control of the South African Central Locust Bureau. Prepared for publication and edited by CHAS. P. LOUNSBURY, Government Entomologist, Cape of Good Hope	294
Proceedings of the Geological Society	294

NUMBER 28.

XLIII. Rhynchotal Notes.—L. By W. L. DISTANT	297
XLIV. The Collections of William John Burchell, D.C.L., in the Hope Department, Oxford University Museum:—	
IV. On the Lepidoptera Rhopalocera collected by W. J. Burchell in Brazil, 1825–1830. By E. G. JOSEPH, of Lincoln College, Oxford	322
XLV. On Hexactinellid Spicules and their Names.—Part II. Supplementary. By R. KIRKPATRICK	347
XLVI. A new Chinese Mole of the Genus <i>Scaptochirus</i> . By OLDFIELD THOMAS	350
XLVII. Three new West African Mammals. By OLDFIELD THOMAS	351
XLVIII. The Caudal Fin of the <i>Elopidae</i> and of some other Teleostean Fishes. By C. TATE REGAN, M.A.	354
XLIX. An interesting Structural Analogy. By AUSTIN HOBART CLARK	358
L. Descriptions and Records of Bees.—XXVII. By T. D. A. COCKERELL, University of Colorado	361
LI. Two new African Shrews. By WILFRED H. OSGOOD	369
LII. List with Notes on some Land-Shells from the Island of Muswar, Dutch New Guinea, and Descriptions of new Species and Varieties of <i>Planispira</i> (<i>Cristigibba</i>), <i>Papuina</i> , <i>Calycia</i> , and <i>Leptopoma</i> . By HUGH C. FULTON	370
LIII. Five new <i>Culicidae</i> from Ashanti. By F. V. THEOBALD, M.A. &c.	373
LIV. The Application of Mr. G. W. Smith's Theory of Dwarf Males to <i>Myzostoma</i> . By A. F. COVENTRY, Magdalen College, Oxford	378
LV. On the Affinities of <i>Astrosclera willeyana</i> , Lister. By R. KIRKPATRICK. (Plate XI.)	380
LVI. New Mammals from the E. Indian Archipelago. By OLDFIELD THOMAS	383

<i>New Books</i> :—PIERCE, W. DWIGHT. A Monographic Revision of the Twisted Winged Insects comprising the Order <i>Strepsiptera</i> , Kirby.—Indian Insect Life. A Manual of the Insects of the Plains (Tropical India). By H. MAXWELL-LEFFROY, M.A., F.E.S., F.Z.S., Entomologist, Imperial Department of Agriculture for India. Assisted by F. M. HOWLETT, B.A., F.E.S., Second Entomologist, Imperial Department of Agriculture for India.—The Fauna of British India, including Ceylon and Burma. Edited by A. E. SHIPLEY, M.A. &c. Dermaptera (Earwigs). By MALCOLM BURR, D.Sc.	387—389
Proceedings of the Geological Society	390, 391

NUMBER 29.

LVII. Descriptions of some new Species of Heterocera from Tropical Africa. By HERBERT DRUCE, F.L.S. &c.	393
LVIII. A Revision of the Genus <i>Pelecorhynchus</i> of the Family <i>Tabanidæ</i> . By GERTRUDE RICARDO	402
LIX. Descriptions and Records of Bees.—XXVIII. By T. D. A. COCKERELL, University of Colorado	409
LX. Three new African Rodents. By OLDFIELD THOMAS	419
LXI. Notes on some Palm-Civets. By ERNST SCHWARZ	422
LXII. Two new Mammals from the Malay Peninsula. By OLDFIELD THOMAS	424
LXIII. Some Remarks on the Teleostean Caudal Fin. By RICHARD H. WHITEHOUSE, M.Sc., University of Birmingham	426
LXIV. A Preliminary Note on the <i>Alciopinæ</i> , <i>Tomopteridæ</i> , and <i>Typhloscolecidæ</i> from the Atlantic adjacent to Ireland. By R. SOUTHERN, B.Sc., Irish National Museum, Dublin	428
LXV. Descriptions of new African Moths. By Sir GEORGE F. HAMPSON, Bart., F.Z.S., &c.	430
<i>New Book</i> :—Yorkshire Type Ammonites. Edited by S. S. BUCKMAN, F.G.S.	464

NUMBER 30.

LXVI. Descriptions of new African Moths. By Sir GEORGE F. HAMPSON, Bart., F.Z.S., &c.	465
LXVII. Descriptions and Records of Bees.—XXIX. By T. D. A. COCKERELL, University of Colorado	496
LXVIII. Descriptions of a new Hawk-Moth and some new <i>Syntomidæ</i> . By the Hon. WALTER ROTHSCHILD, Ph.D.	506

	Page
LXIX. Descriptions of Four new African Snakes in the British Museum. By G. A. BOULENGER, F.R.S.	512
LXX. Notes on the Gastropod Foot and Branchial Cavity. By HILDA M. BISHOP, University College of Wales, Aberystwyth. (Plates XII. & XIII).	513
LXXI. Note on Two Species of the Genus <i>Pandalus</i> . By W. T. CALMAN, D.Sc.	524
LXXII. On <i>Cercocobus aterrimus</i> and <i>Cercocobus albigena</i> . By ERNST SCHWARZ	527
LXXIII. On the Caudal Fin of the <i>Clupeidæ</i> , and on the Teleostean Urostyle. By C. TATE REGAN, M.A.	531
LXXIV. Three new Asiatic Mammals. By OLDFIELD THOMAS.	534
<i>New Book</i> :—Catalogue of the Lepidoptera Phalænæ in the British Museum. Vol. IX. Catalogue of the <i>Noctuidæ</i> in the Collection of the British Museum. By Sir GEORGE F. HAMPSON, Bart. . .	536
Proceedings of the Geological Society.	537, 538
Index	539

PLATES IN VOL. V.

PLATE I.	Permo-Carboniferous fishes and Upper Palæozoic shells from Madagascar.
II. {	Crustacea found in a deep-sea Cephalopod.
III. {	
IV.	Marine and freshwater shells from the Falkland Islands.
V.	Wood-boring Crustacea from Christmas Island.
VI. {	Salpingoeca vaginicola and Polycoeca dumosa.
VII. {	
VIII.	Hexactinellid sponge spicules.
IX. {	Gobius minutus, &c.
X. {	
XI.	Astrosclera willeyana.
XII. {	Gastropod foot and branchial cavity.
XIII. {	

THE ANNALS
AND
MAGAZINE OF NATURAL HISTORY,
INCLUDING
ZOOLOGY, BOTANY, AND GEOLOGY.



CONDUCTED BY

ALBERT C. L. G. GÜNTHER, M.A., M.D., PH.D., F.R.S.,
WILLIAM CARRUTHERS, PH.D., F.R.S., F.L.S., F.G.S.,

AND

WILLIAM FRANCIS, F.L.S.

BEING A CONTINUATION OF THE "ANNALS" COMBINED WITH
MESSRS. LOUDON AND CHARLESWORTH'S "MAGAZINE OF NATURAL HISTORY."

WITH FOUR PLATES.

LONDON:

TAYLOR AND FRANCIS, RED LION COURT, FLEET STREET.

Sold by Simpkin, Marshall, Hamilton, Kent, & Co., Ltd.; Baillière, Paris;
Hodges, Figgis, & Co., Dublin; and Asher, Berlin.

Double Number. Price Five Shillings.

THE FLORA OF THE PRESIDENCY OF BOMBAY.

Published under the authority of the Secretary of State for India in Council.

By THEODORE COOKE, C.I.E.,

M.A., M.A.I., LL.D., F.L.S., F.Z.S., &c.

FORMERLY PRINCIPAL OF THE COLLEGE OF SCIENCE AT POONA AND DIRECTOR
OF THE BOTANICAL SURVEY OF WESTERN INDIA.

Vol. I., Part I. 8s., Part II. 9s., Part III. 10s.

Vol. II., Parts I. & II. 9s. each, Parts III. & IV. 8s. each, Part V. 12s.

TAYLOR and FRANCIS, Red Lion Court, Fleet Street, E.C.

BIOLOGIA CENTRALI-AMERICANA.

Edited by F. DUCANE GODMAN.

SUBJECTS IN PROGRESS.

ZOOLOGY.

Chilopoda and Diplopoda. By R. I. Pocock. (Pp. 1-152, pls. i.-xi.)

Coleoptera. Vol. IV. part 3 (RHYNCHOPHORA: Curculionidæ). By
D. SHARP. (Pp. 1-168, pls. i.-vi.)

Coleoptera. Vol. IV. part 7 (RHYNCHOPHORA: Curculionidæ, *continued*).
By G. C. CHAMPION. (Pp. 1-48, pls. i., ii.)

The Price of each Part is 21s.

London: Published for the Editor by DULAU & Co., Soho Sq., W.

KIRBY'S SYNONYMIC CATALOGUES OF INSECTS.

SUPPLEMENT TO DIURNAL LEPIDOPTERA. 1871-
1877. 8s. 6d. *net*.

LEPIDOPTERA HETEROCERA. — SPHINGES AND BOM-
BYCES. 1892. £2 2s. *net*.

NEUROPTERA ODONATA. 1890. 16s. *net*.

TAYLOR and FRANCIS, Red Lion Court, Fleet Street, E.C.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[EIGHTH SERIES.]

"..... per litora spargite muscum,
Naiades, et circum vitreos considite fontes:
Pollice virgineo teneros hic carpite flores:
Floribus et pictum, divæ, replete canistrum.
At vos, o Nymphæ Craterides, ite sub undas;
Ite, recurvato variata corallia trunco
Vellite muscosis e rupibus, et mihi conchas
Ferte, Deæ pelagi, et pingui conchyliis succo."
N. Parthenii Giannettasi, Ecl. 1.

No. 25. JANUARY 1910.

I.—*On some Permo-Carboniferous Fishes from Madagascar.*
By A. SMITH WOODWARD, LL.D., F.R.S., of the British
Museum.

[Plate I. figs. 1–5.]

(Published by permission of the Trustees of the British Museum.)

MR. GEORGE G. DIXON has recently presented to the British Museum a collection of nodules containing fossil fishes, which he obtained from a shaly formation on the right bank of the Mahavavy River, opposite the village of Andogozo, near the extreme north-west coast of Madagascar. These specimens are of much interest, because they clearly belong to Upper Palæozoic types which have not hitherto been described from Madagascar*; and they are associated with obscure traces of small freshwater shells, which Mr. R. Bullen Newton determines to be new. The shape of each nodule, as usual, depends on the contour of the contained fish, but prominent slender portions, such as parts of the caudal fin and the

* The occurrence of Permian Reptiles, Fishes, and Plants in Madagascar has been only briefly recorded by M. Boule, 'Comptes Rendus,' vol. cxlvi. (1908), p. 502.

apices of the dorsal and anal fins, are generally wanting. The fishes belong only to two genera and species, the one *Platysomid*, the other *Coelacanth*.

I. *Ecrinesomus dixonii*, gen. et sp. n. (Pl. I. figs. 1-4.)

The *Platysomid* fish, which attained a length of not less than 25 cm., appears to be very common, and the series of specimens obtained by Mr. Dixon exhibits nearly all its principal characters. It is very deeply fusiform, with rounded, not angulated, dorsal and ventral borders; the tail forming at least half the total length of the fish and tapering rapidly to a very slender pedicle for the caudal fin. The maximum depth of the trunk is about equal to its length from the pectoral arch to the base of the caudal fin. All the external bones and scales, with the larger rays of the median fins, are ornamented with closely-arranged parallel striæ or very fine ridges, which are generally disposed in a nearly vertical direction.

The head is always crushed in the fossils, and the parts have so much decayed that they can only be studied in impression. It is therefore difficult to distinguish the several bones. The most conspicuous element is a nearly square post-temporal plate (Pl. I. figs. 1, 2, *ptt.*), on which the vertical striation tends to become subdivided into tubercles near the upper and median border. A similar subdivision of the ornament also occurs near the median ridge of the frontal region. The cheek is completely covered with thin plates, on which the ornamental striæ sometimes tend to become concentric instead of vertical. The posterior circumorbitals (fig. 2, *po.*) seem to have been divided into more numerous plates than in known *Platysomids*; but this may be a false appearance due to infilled radiating branches of the traversing sensory canal. The maxilla is evidently a deepened plate, but its precise shape is uncertain. The teeth are never seen, and must have been minute. The operculum (fig. 2, *op.*) is at least twice as deep as wide, and completely covered with the nearly vertical wavy striæ, which do not conform to its border. The suboperculum (*subop.*) is relatively small and similarly ornamented.

The endoskeleton of the trunk is imperfectly ossified, the cartilaginous vertebral arches and fin-supports being only superficially hardened and thus appearing hollow in the fossils. There are no traces of vertebral centra, and the arches are only rarely seen. A close series of neurals is exposed in the anterior part of the abdominal region in the type-specimen

(fig. 1, *n.*) ; but it can only be stated that they are stout rods. As shown by a vague impression in nearly all specimens (*e. g.* fig. 1, *x*), the abdominal cavity is bordered behind by a large curved bone, which extends downwards and forwards from the vertebral axis to the origin of the anal fin. This is of uncertain nature, but evidently corresponds with a bone which is always conspicuous in the naked Permian Platy-somid, *Dorypterus* *.

In the pectoral arch the clavicle is relatively large, and ends below in a convex expansion (fig. 2, *cl.*). This expansion and all the exposed plates of the arch are closely ornamented, like the head-bones, with more or less nearly vertical and wavy striations. The pectoral fin (figs. 2, 3, *pet.*) is inserted just above the expansion, on the flank, and its longest rays extend across about 12 vertical rows of flank-scales. It consists of not less than 25 rays, supported by 7 or 8 elongated, hourglass-shaped basals (*b.*), which are only superficially calcified. The foremost rays rapidly lengthen in succession at the front or upper border of the fin, and the longest rays are within its anterior or upper half. All are crossed by distant articulations, and all except the foremost lengthening rays are finely subdivided distally. The fin bears no fulcra. There are no traces of pelvic fins even in well-preserved specimens. The dorsal and anal fins are remarkably extended, the anal arising at the hinder end of the abdominal cavity and terminating on the contracted caudal pedicle, while the dorsal arises even slightly further forwards with the same hinder termination. Each fin is borne by stout endoskeletal supports much less numerous than the dermal rays; and those of the dorsal fin are clearly shown in the usual double series (fig. 4, *bo.*, *ao.*). The two fins are similar in shape, the foremost rays being crowded, rapidly increasing in length at the anterior border to a low peak, and then more gradually shortening again until the hinder half of the fin is low and fringe-like, with less crowded and finer rays. All the rays are crossed by distant articulations, and those of the stout front portion (fig. 3 *b*) are ornamented with oblique and partially longitudinal striæ, which are fewer and coarser than the striæ of the scale-ornament. Of the caudal fin, only the base is observable in the type-specimen (fig. 1, *c.*). The upper caudal lobe bears large ridge-scales, while the slender fin-rays are crowded and crossed by distant articulations. There are no fulcra on the median fins.

* A. Hancock and R. Howse, "On *Dorypterus hoffmanni*, Germar, from the Marl Slate of Midderidge, Durham," Quart. Journ. Geol. Soc. vol. xxvi. (1870), p. 632.

The scales completely cover the trunk and are in regular vertical series, except near the base of the anal fin, where they taper and are reflexed, and below the hinder half of the dorsal fin, where they also turn sharply forwards. As shown by impressions in the type-specimen, the inner face of each scale is smooth, thickened only at the front edge, and the peg-and-socket articulation is both wide and deep. The outer face is always completely covered with an ornament of closely-arranged striæ, which are only slightly wavy and are generally directed obliquely downwards and forwards (fig. 3 a), though sometimes almost vertical on the principal flank-scales in the anterior half of the abdominal region. The striæ of adjacent scales are not conformable, and on a few dorsal scales they sometimes show a subdivision into tubercles. On the ridge-scales of the ventral border in advance of the anal fin there is a conspicuous close series of backwardly-inclined denticles or serrations. The principal flank-scales on the anterior part of the abdominal region are more than twice as deep as wide. A single regular series of small square or oblong scales forms the base-line of the dorsal and anal fins. The course of the lateral line is only very feebly marked by a series of short vertical slits, one near the upper end of most scales in a row extending backwards from the post-temporal plate.

The fish thus described agrees with *Platysomus* and differs from all other *Platysomidæ** in the relatively large size both of the square post-temporal and of the deep operculum. It also resembles the typical *Platysomus* in its external ornamentation. It is distinguished from that genus, however, by the high position of the pectoral fin on the flank and apparently by the absence of pelvic fins; also by the great relative length of its caudal region. It may therefore be referred to a new genus *Ecrinesomus*, defined as follows:—

Trunk deeply fusiform, with rounded contour, and caudal region relatively elongated. External bones and scales finely ornamented with nearly vertical striæ; post-temporal plate large and quadrate in shape; operculum much larger and deeper than suboperculum. Fin-rays distantly articulated and distally bifurcated; no fulcra. Pectoral fins large, raised on the flank; pelvic fins absent; dorsal and anal fins much extended, acuminate in front, low and fringe-like behind. Scales completely covering the trunk, in regular

* R. H. Traquair, "On the Structure and Affinities of the *Platysomidæ*," Trans. Roy. Soc. Edinb. vol. xxix. (1879), pp. 343-391, pls. iii.-vi.

vertical series, which taper and are reflexed at the base of the anal fin.

The type-species, of the form and proportions already described, may be appropriately named *E. dixonii*, after its discoverer.

It may be added that a single specimen of this fish was also obtained by Mr. Dixon from the Loky district in N.E. Madagascar, exactly in the same condition as the specimens from Andogozo.

II. *Cœlacanthus madagascariensis*, sp. n. (Pl. I. fig. 5.)

The only specimen of this species represents a fish about 18 cm. in total length. It is much obscured by the oxides of iron and manganese, and the head-bones and fins are crushed and broken, but it merely lacks the supplementary caudal fin. The length of the head with opercular apparatus somewhat exceeds the maximum depth of the trunk at the anterior dorsal fin, and must have equalled one quarter of the total length of the fish.

There is nothing worthy of note in the remains of the head, except that some of the cheek-plates are ornamented with the usual concentric ridges; but the operculum, which is much deeper than wide, is remarkable as being ornamented with large irregularly-ovoid tubercles, which are very closely arranged. Their appearance in impression is shown in fig. 5 *a*, magnified three times, and it is clear that they are not arranged in lines concentric with the border of the bone. In the axial skeleton of the trunk there are remains of the ordinary neural arches and caudal hæmal arches, each consisting of a single piece, forked at the base and only superficially calcified. No ribs are preserved, and the air-bladder is only imperfectly indicated.

The pelvic fins are inserted just behind the anterior dorsal, which comprises nine stout rays. The posterior dorsal fin consists of very delicate though long rays, and the distance between its origin and that of the anterior dorsal equals that between the latter and the occiput. The principal caudal fin comprises about 12 rays above and below.

As shown by impressions, all the scales are ornamented with very fine and closely-arranged longitudinal ridges or striæ (fig. 5 *b*). These ridges tend to converge backwards on each scale, and they are very rarely subdivided into elongated tubercles.

In the nature of its scale-ornament, the Madagascar fossil agrees with the known Carboniferous species rather than

with the typical Upper Permian species*. It differs from all known forms in the ornamentation of its operculum, and evidently represents a new species which may be named *Cœlacanthus madagascariensis*.

EXPLANATION OF PLATE I. FIGS. 1-5.

Ganoid Fishes from a Permo-Carboniferous Formation at Andogozo, Mahavavy River, N.W. Madagascar.

- Fig. 1.* *Ecrinesomus dixonii*, gen. et sp. n.; type-specimen in right side view. The scales below the vertebral axis in the abdominal region shown as impression of inner face, the other scales as impression of outer face. (B.M. no. P. 10756.)
- Fig. 2.* Ditto; head and anterior abdominal region. (B.M. no. P. 10758.)
- Fig. 3.* Ditto; fragment showing pectoral fin, with (3*a*) flank-scale and (3*b*) portion of anal fin-rays enlarged three times. (B.M. no. P. 10759.)
- Fig. 4.* Ditto; portion of dorsal fin with some of the endoskeletal supports. (B.M. no. P. 10760.)
- Fig. 5.* *Cœlacanthus madagascariensis*, sp. n.; type-specimen, with (5*a*) portion of impression of operculum and (5*b*) scales enlarged three times. (B.M. no. P. 10768.)

a., anal fin; *ao.*, axonosts of dorsal fin; *b.*, basals of pectoral fin; *bo.*, base-osts of dorsal fin; *c.*, base of caudal fin; *cl.*, lower end of clavicle; *d.*, dorsal fin; *ll.*, scale of lateral line; *n.*, neural spines; *op.*, operculum; *orb.*, orbit; *pct.*, pectoral fin; *plt.*, post-temporal; *sop.*, suboperculum; *x.*, internal bone at hinder border of abdominal cavity. Unless otherwise stated, the figures are of the natural size.

II.—Notes on some Upper Palæozoic Shells from Madagascar. By R. BULLEN NEWTON, F.G.S., of the British Museum.

[Plate I. figs. 6-11.]

(Published by permission of the Trustees of the British Museum.)

ACCOMPANYING the fish-remains discovered by Mr. George G. Dixon at Andogozo, near the west coast of the northern end of Madagascar, which are recognized by Dr. A. S. Woodward as of late Palæozoic age, are certain small mollusca of rather imperfect preservation, although sufficiently interesting to claim some remarks on this occasion.

The specimens consist of (1) a discoidal gastropod, embedded as a limonite cast on the inner surface of a narrow

* A. S. Woodward, 'Catalogue of Fossil Fishes in the British Museum,' pt. ii. (1891), pp. 399-408.

elongate nodule, associated with one of the fish-fragments; and (2) a series of minute pelecypod valves crowded together in a similar but smaller nodule and of more oval shape, which apparently belong to one species. The gastropod seems to be easily determined as a form of *Planorbis*, whilst the bivalves may be referred to the genus *Naiadites* of J. W. Dawson, originally described from the Upper Carboniferous rocks of Nova Scotia.

So far as can be ascertained, no *Planorbis* has been recorded from rocks older than the Lias, Charles Moore having described a species from the lower part of that formation together with other freshwater mollusca which had been found in the Mendip country of England (Quart. Journ. Geol. Soc. 1867, vol. xxiii. pl. xv. fig. 10, p. 548). Strange to say, the affinities of the Malagasy shell appear to resemble the well-known modern form of *Planorbis carinatus* of Müller, on account of its possessing, among its other characters, a peripheral carination, the presence of which would place it in Stein's genus *Tropidiscus* (established on the Müller shell just mentioned), but for present purposes it is, perhaps, advisable to recognize the specimen under the more popular name of *Planorbis*.

The occurrence of *Naiadites* is also of considerable interest, since it assists in confirming the view that these fossiliferous nodules are of Upper Palæozoic age. It is only quite recently that Palæozoic fossils have been discovered in Madagascar by Captain Colcanap, of the French army. Previously, Professor Marcellin Boule had remarked on a series of sandstones, conglomerates, and schists forming the base of the sedimentary series in that country, which reposed on the crystalline rocks and extended with them from north to south of the island. Apparently unfossiliferous, with the exception of silicified trunks of trees which had never been satisfactorily determined, these deposits were regarded as of Triassic age, being compared with the Karoo formation of South Africa and the Gondwana Series of India ("La Géologie et la Paléontologie de Madagascar": Congrès Géologique International, viii. session, France, 1900 [Paris 1901], p. 5, pl. xii. = Geological Map of Madagascar). When the new material from Capt. Colcanap was examined, Professor Boule was able to announce the discovery of a Permian fauna and flora as well as coal deposits in the Mahafaly district of the south-western part of the country—forming part of the supposed Triassic rocks previously mentioned,—including remains of reptiles, fishes, and *Glossopteris*; the latter determined by Professor Zeiller as

Glossopteris indica (Compt. Rendus, 1908, vol. cxlvi. pp. 502-504 & vol. cxlvii. pp. 818, 819), a species of fern known from the late Palæozoic deposits of South Africa, India, Australia, Tasmania, Falkland Islands, and South America (Argentina).

The discovery of such an assemblage of fossils was a great advance on our previous knowledge of Madagascan geology, because it proved, on the one hand, relationships with the Karoo beds of Southern Africa, and, on the other, with the Gondwana deposits of India and other geologically related regions. With regard to the molluscan remains brought home by Mr. Dixon from this northern district of the island, it may be mentioned that neither a Planorbiform shell of so ancient an horizon nor *Naiadites* have yet been recorded from Africa or India. The Karoo formation of Africa, and especially the Beaufort-beds division, has yielded freshwater pelecypods belonging to the genera *Palæomutela* and *Palæanodonta* of Professor Amalitzky, which, that author some years since pointed out, resembled almost species for species a fauna characteristic of the upper part of the Russian Permian formation, and so he considered those distant deposits as homotaxially equivalent (Quart. Journ. Geol. Soc. 1895, vol. li. pp. 337-351, pls. xii., xiii.).

In the latest work on South African geology we find that Dr. A. W. Rogers acknowledges Amalitzky's work and brackets the Beaufort series with the Permian of Europe (A. W. Rogers and A. L. Du Toit, 'An Introduction to the Geology of Cape Colony,' 1909, 2nd edition, pp. 231, 243). No similar bivalve mollusca are known from the Gondwana beds of India, and it is chiefly from the facies of the *Glossopteris* flora characterizing those deposits that a homotaxial relationship with the African Karoo has been demonstrated.

It would seem, therefore, that in future correlation schemes connected with the geological history of Madagascar we have to recognize not only Captain Colcanap's and Professor Boule's important discoveries as to the presence of Upper Palæozoic deposits in that island, but also to include the valuable fish and molluscan remains collected by Mr. Dixon, which add a new interest to the palæontological features of those beds.

DESCRIPTION OF THE MOLLUSCA.

GASTROPODA.

Planorbis dixonii, sp. n. (Pl. I. figs. 6, 7.)

Shell small, discoidal, plano-convex, and furnished with a smooth peripheral carination; outer whorl wide and equal

near the aperture to the width of the remainder of the spiral system.

Dimensions : 5·5 by 4 mm.

This fossil bears a remarkable resemblance to Müller's modern species *Planorbis carinatus*, which forms the type of Stein's genus *Tropidiscus*, on account of the possession of a peripheral carination. From its condition as a limonite cast sculpture-markings are scarcely decipherable. It occurs embedded on the inner surface of one of the nodules accompanied by a fish-fragment, which, according to Dr. A. S. Woodward, is not capable of determination. A basal disc view of the specimen is exhibited on one half of the nodule, whilst its counterpart in the other half shows a discoidal interior of the outer volution as well as obscure traces of the internal volutions. The specific name is applied in honour of the discoverer.

PELECYPODA.

Naiadites madagascariensis, sp. n. (Pl. I. figs. 8-11.)

Shell small, subquadrate, oblique, submedianly elevated, sloping laterally; hinge-line straight; umbones anterior; pallial line entire; sculpture consisting of rather distant concentric lines of growth and finer striations on the lateral regions.

Dimensions : 3·5 by 3 mm.

The valves of this shell are grouped together on the inner surface of one of the small nodules and appear mostly as internal cavities, although a wax impression reproduces satisfactorily their original external condition. From this it is apparent that the shell with such characters as are referred to may be identified with Dawson's genus *Naiadites*, a freshwater form originally described from the Coal-measure deposits of Nova Scotia, and founded on the type of *Naiadites carbonarius* of the same author ('Acadian Geology,' supplement to 1st edition, 1860, p. 43, & 2nd edition, 1868, p. 204). Some of the interiors show very clearly the simple and non-sinuate character of the pallial impression; but the details of the hinge are quite obscure, from the result probably of immature growth, so that no horizontal striations are observable, such as Dr. Wheelton Hind regards as characteristic of this genus ('Monograph Palæontographical Society,' 1895, p. 126).

It is possible that the affinities of this mollusc may be looked for between Dawson's *N. carbonarius* and *N. modiolaris* of J. de C. Sowerby, both of which occur in the coal-formation of Britain and the Continent.

Madagascar is quite a new area for the genus *Naiadites*, and it has not yet been recorded from the Karoo formation of South Africa, which contains other forms of fresh-water bivalves, such as *Palæomutela* and *Palæanodonta*. Some years since Professor Amalitzky described several forms of this genus from the Russian Permian, but on a closer study he found that they were *Anodonta*-like shells and differed materially from the original type of *Naiadites* of 1860; he therefore founded the new genus *Palæanodonta* for the reception of those species (Quart. Journ. Geol. Soc. 1895, vol. li. pp. 346, 347). It is now generally recognized that Salter's *Anthracopectera* of a later date is the equivalent of Dawson's *Naiadites*.

EXPLANATION OF PLATE I. FIGS. 6-11.

Upper Palæozoic (Permo-Carboniferous) Mollusca from Andogozo, on the Mahavavy River, North-western Madagascar; presented to the British Museum by the collector, Mr. George G. Dixon.

Figs. 6, 7. Planorbis dixonii, sp. n. $\times 4$. Fig. 6 = basal disc view; fig. 7 = counterpart of same, with obscure evidence of inner whorls.

Fig. 8. Naiadites madagascariensis, sp. n. Internal face of nodule showing the gregarious nature of the valves, slightly enlarged.

Fig. 9. External aspect of a right valve. { Drawn from wax

Fig. 10. " " " left valve. { impression. $\times 4$.

Fig. 11. Interior of a left valve showing pallial line. $\times 4$.

III.—*Descriptions of Oriental Capsidæ.*

By W. L. DISTANT.

[Concluded from vol. iv. p. 523.]

AZIZUS, gen. nov.

Head deflected in front of eyes, longer than broad, eyes large and globose, prominently projecting beyond the anterior margins of the pronotum; antennæ somewhat long and robust, first joint stoutest, a little longer than head, slightly curved, second joint nearly three times as long as first, third about two-thirds the length of second and nearly twice as long as fourth; rostrum passing the posterior coxæ; pronotum nearly twice as broad at base as long and nearly three times as broad as anterior margin, the basal margin concave, transversely constricted near anterior margin, the anterior area with a small tubercle on each lateral margin, the lateral

margins oblique, the disk strongly deflected anteriorly; scutellum large, broad at base, moderately deflected posteriorly; corium about three times as long as broad, its apical margins subtruncate, the lateral margins nearly straight; cuneus longer than broad; membrane considerably passing abdominal apex, with an elongate, oblong, posteriorly truncate cell before cuneus and a very small cell at base, anterior and intermediate legs of moderate size, the tibiæ spinulose; posterior legs mutilated in typical specimen.

This genus I include in the division Teratodellaria as used in my Indian enumeration.

Azizus basilicus, sp. n.

Head, pronotum, and scutellum black, very finely and obscurely palely pilose; antennæ with the first and fourth joints castaneous, the second and third joints ochraceous; clavus and corium dull castaneous brown, distinctly, thickly, finely, palely pilose, the extreme costal margin of the latter ochraceous; cuneus pale bright castaneous, pilose as on corium; membrane fuscous, with iridescent reflections; body beneath fuscous brown; anterior and intermediate femora castaneous, tibiæ and tarsi pale ochraceous, coxæ and acetabulæ more or less testaceous (posterior legs mutilated in typical specimen); structural characters as in generic diagnosis.

Length $5\frac{1}{2}$ mm.

Hab. Bengal; Pusa (Lefroy).

Mr. Maxwell-Lefroy sent me a single example of this species.

SEREBÆUS, gen. nov.

Head globose, longer than broad, apically acuminate, anteriorly deflected, eyes small, moderately adpressed, their posterior margins reaching base of head; antennæ slender, first joint distinctly thickened and inwardly finely spinulose, second about three times as long as first and subequal in length to third, fourth about half as long as third; rostrum reaching the posterior coxæ; pronotum at base twice as broad as long and nearly three times as broad as anterior margin, posterior margin concave, exposing the mesonotum, lateral margins sinuately oblique, a short distinct anterior collar, behind which it is obscurely transversely impressed; scutellum small, tumid, transversely impressed; corium (including cuneus) as long as posterior tibiæ; cuneus a little longer than broad, the apex subacute; membrane

considerably passing the abdominal apex; legs somewhat slender, the femora moderately thickened, the posterior tibiæ spinulose, posterior tarsi with the first joint a little longer than second.

In the Indian enumeration this genus may be placed near *Tyraquellus*.

Serebæus discriminatus, sp. n.

Head, pronotum, and scutellum castaneous brown, eyes dull sanguineous; antennæ pale ochraceous, the basal joint castaneous; corium pale greyish, subhyaline, base of clavus and a transverse broad fascia crossing corium and apex of clavus fuscous brown; cuneus bright, pale castaneous; membrane pale fuliginous with iridescent reflections; body beneath sanguineous, legs and rostrum stramineous, spinules to the posterior tibiæ fuscous; first joint of antennæ longly spinulose anteriorly; lateral pronotal margins with a few long hairs; scutellum and corium distinctly palely pilose; structural characters as in generic diagnosis.

Length 4 mm.

Hab. Ceylon; Peradeniya (*Green*).

DIOCLERUS, gen. nov.

Head strongly deflected anteriorly, viewed from above short and broad, eyes prominent, oblique, considerably extending beyond the anterior margins of the pronotum; antennæ with the first joint a little longer than pronotum, slightly thickened near base, second joint twice as long as first, third a little more than half the length of second; rostrum reaching the posterior coxæ; pronotum thickly punctate, at base about one-third broader than long, and three times broader than anterior margin, a distinct narrow anterior collar, behind which it is transversely impressed, and on the anterior area centrally longitudinally sulcate, basal and anterior margins truncate, the lateral margins oblique; scutellum small, broadly subtriangular, finely obscurely pilose; corium (including cuneus) subequal in length to posterior tibiæ, excluding costal area and including clavus distinctly thickly punctate and subpilose, the costal margin moderately convex, narrowing to apex, cuneus slender, longer than broad, pilose; membrane almost as long as corium (excluding cuneus), and with a longitudinal posteriorly curved cell on basal area; legs of moderate length, pilose.

In the Indian enumeration this genus may be placed between *Cyrtorrhinus* and *Zanchius*.

Dioclerus præfectus, sp. n.

Head, pronotum, scutellum, clavus, and body beneath golden-yellow; corium, cuneus, membrane, and legs pale stramineous; eyes and an apical spot to abdomen black; antennæ fuscous brown, the basal joint obscure stramineous; apices of femora slightly infuscate, tarsal claws black; corium with a small dark spot on each side of claval apex, the costal area impunctate and thus appearing paler in hue; other characters as in generic diagnosis.

Length 4 mm.

Hab. Ceylon; Peradeniya (*Green*).

DORTUS, gen. nov.

Head longer than broad, but very strongly deflected in front of eyes, which are large and prominent and extend beyond the anterior margins of the pronotum; antennæ longly pilose, first joint about as long as head, scarcely thickened, second more than twice as long as first, third and fourth together shorter than second; rostrum passing the intermediate coxæ; pronotum at base much broader but not twice as broad as long, but more than twice broader than anterior margin, a very narrow anterior collar, transversely impressed before anterior margin, and thus enclosing two transverse callosities, with the exception of which the surface is thickly punctate, lateral margins sinuately oblique, lateral posterior margins oblique, truncate before scutellum; scutellum moderately tumid, subtriangular; corium (excluding cuneus) about as long as posterior tibiæ; clavus and corium (excepting costal area) thickly punctate, cuneus nearly as broad at base as long, and longly pilose; membrane considerably passing the abdominal apex, its greatest length equal to that of corium (excluding cuneus); legs of moderate length, strongly pilose, femora only moderately thickened, the posterior femora slightly more so.

Near *Cyrtorrhinus*, Fieb.

Dortus primarius, sp. n.

Head pale brownish ochraceous, centrally longitudinally darker in hue, eyes black; antennæ ochraceous, pilose, apex of the second joint black, third and fourth joints fuliginous, base of third ochraceous; pronotum pale brownish ochraceous, thickly punctate, the lateral margins broadly piceous, the transverse anterior callosities smooth; scutellum pale brownish ochraceous, with a central longitudinal piceous

fascia and faintly transversely wrinkled; clavus and pronotum pale brownish ochraceous, thickly more darkly punctate, the costal area paler and impunctate, cuneus ochraceous, the apical area piceous, somewhat longly pilose; membrane pale fuliginous; body beneath and legs ochraceous, lateral margins of sternum and abdomen and apical area of abdomen broadly piceous; other characters as in generic diagnosis.

Length 5 mm.

Hab. Tenasserim; Myitta (*Doherty*).

SOHENUS, gen. nov.

Head considerably longer than broad, tumid, eyes somewhat small and adpressed and placed about midway between base and apex, the apical area strongly deflected in front of eyes, the basal area moderately attenuated from eyes to posterior margin; antennæ rather long, first joint shorter than head, second three times as long as first, third almost as long as second and half as long again as fourth; rostrum reaching the intermediate coxæ; pronotum much broader at base than long and more than twice broader than anterior margin, three transverse impressions before anterior margin, the basal area gibbous and deflected to the first transverse impression, and the lateral margins to that impression a little convexly oblique, remaining lateral margins to apex distinctly dislocated at the remaining impressions, posterior margin angularly concave; scutellum about as long as broad at base, strongly deflected posteriorly and transversely impressed near middle, the lateral margins moderately concavely sinuate; corium (including cuneus) as long as head, pronotum, and scutellum together, the costal margin strongly concavely sinuate, apex of clavus almost reaching base of cuneus, which is a little broader than long; membrane about half the length of corium (including cuneus); legs long, posterior tibiæ about as long as scutellum and hemelytra together, posterior tarsi with the first joint a little longest.

Allied to *Armachanus*, Dist., but with the head longer, and with no apical spinous protuberance, &c.

Sohenus proditus, sp. n.

Pale cinnamomeous; eyes black; corium with a somewhat oblique white fascia crossing it and greater part of clavus a little beyond middle, apical inner area of corium somewhat infusate, membrane fuliginous; antennæ with the first, second, and fourth joints pale fuscous brown, third joint pale ochraceous; scutellum darker and a little more castaneous in

hue; head, pronotum, and scutellum very finely obscurely punctate; head beneath, rostrum, sternum, and legs ochraceous; abdomen beneath (excepting base) piceous; other characters as in generic diagnosis.

Length $5\frac{1}{2}$ mm.

Hab. Ceylon; Peradeniya (*Green*).

BADEZORUS, gen. nov.

Head robust, subtriangular, about as long as broad, centrally moderately arched, obscurely transversely striate; antennæ with the first joint thickened, shorter than head, second joint three times as long as first, third and fourth joints subequal in length and together little more than the length of second; rostrum not quite reaching the intermediate coxæ; pronotum at base about twice as long as broad and less than twice as broad as anterior margin, moderately deflected anteriorly, the lateral margins oblique, the posterior angles obtusely rounded; scutellum broad, subtriangular; corium (including cuneus) as long as posterior tibiæ, cuneus broad, at base considerably broader than long; membrane passing abdominal apex, its greatest length almost equalling that of corium (excluding cuneus); legs of moderate length, longly spinulose, the posterior femora distinctly thickened, posterior tarsi with the first and second joints subequal in length.

This genus seems to be clearly located in the division Camptotylaria, Reut.

Badezorus tyrianus, sp. n.

Head dull greyish; antennæ obscure ochraceous, the first joint (more or less) and the base of the second joint piceous; pronotum and scutellum virescent, sparsely palely pilose; corium dull greyish, the clavus virescent, the costal area strongly palely pilose, cuneus dull greyish, darkly pilose, at the internal angle with a small black punctate spot; membrane dull greyish, with pale fuscous mottlings; body beneath and legs pale ochraceous, posterior femora apically black, tibiæ spotted with black, and from these spots on the posterior tibiæ the spinules arise in pairs, all the spinules black, apices of tarsi black; other characters as in generic diagnosis.

Length 3 mm.

Hab. Punjab; Lahore (*Annandale*).

ACRATHEUS, gen. nov.

Head about as long as broad, strongly depressed anteriorly, a little centrally foveately impressed between the eyes, which are of moderate size, reach the base of head, and obliquely slightly project beyond the anterior margins of the pronotum; antennæ slender, first joint almost as long as head, second twice as long as first, third and fourth subequal in length, each a little shorter than second; rostrum robust, reaching the intermediate coxæ; pronotum anteriorly deflected at a short distance from base, thickly strongly punctate, the lateral margins acute, at base twice as broad as long and about one and a half times as broad as anterior margin, anterior and posterior margins truncate, the lateral margins oblique, posterior lateral angles subprominent; scutellum small, broad, subtriangular, a little longitudinally elevate and on lateral areas punctate; corium (including cuneus) as long as posterior tibiæ, including clavus thickly punctate, posteriorly widened and rounded, cuneus very much broader than long, interiorly transversely angulate, cuneal fracture profound; membrane longly passing the abdominal apex, its greatest length almost equalling that of corium without cuneus; legs of moderate length, not spinulose.

To be placed in the division Laboparia and by the profound cuneal fracture near *Bilia*, Dist.

Acratheus nocturnus, sp. n.

Head orange-yellow, eyes black; antennæ stramineous, apical joint infusate; pronotum, scutellum, and corium black; cuneus greyish white, with the basal marginal area black; membrane pale fuscous, with a large greyish-white spot on lateral margin; head beneath orange-yellow or pale reddish; sternum and abdomen black; legs and rostrum pale stramineous; apices of tarsi black; structural characters as in generic diagnosis.

Length 3 mm.

Hab. Bengal; Bhogaon, Purneah Distr. (*Paiva*); Calcutta (Ind. Mus.); Kumaon, Bhim Tal, 4500 feet (*Annandale*).

ARISTOBULUS, gen. nov.

Head about as broad as long, strongly deflected in front of eyes, which are situate at base of head and project beyond the anterior margin of the pronotum; antennæ pilose, with the first joint a little shorter than head and with a few long hairs, second more than twice as long as first, gradually moderately

thickened on apical half, where it is also more strongly pilose, third twice as long as fourth and together as long as second; rostrum almost reaching the posterior coxæ; pronotum at base about one and a half times as broad as long and about one-third longer than anterior margin, the lateral margins rather roundly oblique, the anterior area transversely bi-callose, the posterior area transversely striate; scutellum triangular, transversely constricted near base; corium covering about two-thirds of the abdomen, longitudinally ridged, apical and lateral margins a little rounded, cuneus and membrane undeveloped; abdomen widened posteriorly, deflected on its apical area and pilose; legs of moderate length; tibiæ pilose.

Somewhat allied to the Palæarctic genus *Euryopocoris*.

Aristobulus filius, sp. n.

Head, pronotum, scutellum, and corium shining piceous black; abdomen above and body beneath shining jet-black; legs pale ochraceous; body shortly, finely, greyishly pilose; structural characters as in generic diagnosis.

Length 3 mm.

Hub. Darjiling, 6000 ft.

SAMPSIGERAMUS, gen. nov.

Head broader than long, anteriorly deflected; eyes small, situate at base of head, scarcely projecting beyond the anterior margins of the pronotum; antennæ moderately slender, first joint shorter than head, second about three times as long as first, third shorter than second, but considerably longer than fourth; rostrum distinctly passing the posterior coxæ; pronotum at base more than twice as broad as long and about half as broad again as anterior margin, deflected on anterior half, very obscurely transversely callose on anterior area, anterior and posterior margins truncate, lateral margins a little roundly oblique, the posterior angles obtusely rounded; scutellum subtriangular; corium (excluding cuneus) about as long as posterior tibiæ, including clavus twice as long as broad; cuneus about as broad at base as outwardly long; membrane considerably passing abdominal apex, its greatest length as long as intermediate tibiæ; head, pronotum, scutellum, corium, and cuneus densely pilose; legs spinulose, the tibiæ more thickly and strongly so, the femora, especially the posterior, distinctly thickened; posterior tarsi with the basal joint longest.

The position of this genus is near the Palæarctic *Plagiolytus*, Scott.

Sampsigeramus pilosulus, sp. n.

Head obscure dull ochraceous, thickly pilose; antennæ piceous black, the second joint centrally broadly annulated with dull ochraceous, eyes black; pronotum thickly strongly pilose and darkly granulose, dull ochraceous, the disk more or less discoloured and darker in hue; scutellum somewhat palely piceous, thickly strongly pilose and darkly granulose; corium somewhat palely piceous, the costal area and cuneus pale ochraceous, strongly, thickly, darkly pilose; membrane very pale fuliginous with paler mottlings, especially at the apices of the cells; body beneath black, finely pilose; legs ochraceous, annulated with black, the posterior femora much more distinctly so than the anterior or intermediate femora, tibial spinules long, black, placed in pairs at the black annulations, apices of the tarsi black; structural characters as in generic diagnosis.

Length 3 mm.

Hab. Ceylon; Hakgata (*Green*).

On *Anaphalis oblonga*, D. L. (*E. E. Green*).

RAGMUS, gen. nov.

Head as long as broad, deflected anteriorly, eyes globular, of moderate size, placed at base of head, scarcely projecting beyond the anterior margins of the pronotum; antennæ with the first joint shorter than head, slightly thickened and with two spinules, second joint more than three times as long as first and spinulose; rostrum reaching the intermediate coxæ; pronotum at base more than twice as broad as long and less than twice as broad as anterior margin; posterior margin concave, exposing the mesonotum, two transverse callosities before anterior margin, the lateral margins oblique; scutellum subtriangular; corium (including cuneus) only slightly longer than posterior tibiæ; cuneus as broad at base as outwardly long and distinctly longly sparsely pilose; membrane considerably passing the abdominal apex; legs of moderate length, anterior and intermediate femora slightly, posterior femora much more distinctly spinulose, tibiæ distinctly, longly spinulose; posterior tarsi with the basal joint longest.

Ragmus importunitas, sp. n.

Pale ochraceous, probably more virescent in living specimens; eyes and third and fourth joints of antennæ piceous black; head with two transverse darker impressions in front of eyes and a more or less distinct central foveation near

base; cuneus distinctly, more or less darkly, sparsely pilose; membrane hyaline; body beneath and legs pale ochraceous, anterior and intermediate femora slightly, posterior femora more distinctly spotted with black, tibiæ (the anterior less prominently so) spotted with black, the spinules black and placed near the black spots, apices of the tarsi black; other characters as in generic diagnosis.

Length $3\frac{1}{2}$ mm.

Hab. Ceylon; Peradeniya (*Green*).

Punctures leaves of *Crotalaria verrucosa* and *C. incarna* (*E. E. Green*).

Ragnus pellucidus, sp. n.

Allied to *R. importunitas*, but smaller, paler, and somewhat uniformly greyish ochraceous; antennæ concolorous, the third and fourth joints not piceous; legs more obscurely spotted with black.

Length 3 mm.

Hab. Simla Hills; Dharampur, 5000 ft. (*Annandale*). Punjab; Lahore (*Annandale*). Malabar; Cochin State, Ernakulam (*Annandale*).

This species seems to be quite distinct from its Ceylonese ally, which is perfectly constant in a long series sent to me by Mr. Green.

Psallus kurseongensis, sp. n.

♂. Black, thickly palely pilose; lateral margins of the corium narrowly ochraceous; cuneus sometimes pale castaneous, its basal and apical margins more or less distinctly pale ochraceous; membrane fuliginous, the cellular and apical margins paler; body beneath black, greyishly pilose; legs ochraceous, apices of anterior and intermediate femora, posterior femora (excluding basal areas), bases of anterior and intermediate tibiæ, macular annulations to posterior tibiæ, and the apices of the tarsi black; first and second joints of antennæ black, third and fourth palely fuscous, first joint as long or nearly as long as head, second joint more than twice the length of first; rostrum ochraceous, about reaching the intermediate coxæ; pronotum with a transverse foveate impression on each side of anterior area; tibiæ spinulose, the spinules on the posterior tibiæ inserted at the black spots; femora moderately but distinctly thickened, the posterior femora more distinctly so.

Length $3\frac{1}{2}$ to 4 mm.

Hab. E. Himalayas; Kurseong, 5000 ft. (*Ind. Mus.*).

IDATIUS, gen. nov.

Head about as long as broad, not foveately sulcate between the eyes, which project considerably beyond the anterior margins of the pronotum; antennæ with the first and second joints moderately thickened, the first distinctly shorter than head, second four times the length of first, third and fourth slender, but together not so long as second; rostrum robust, reaching the intermediate coxæ; pronotum at base twice as broad as long and about twice as broad as at anterior margin, deflected anteriorly, the lateral margins a little roundly oblique, the posterior margin subtruncate; scutellum somewhat large and triangular, moderately transversely impressed before middle; corium (excluding cuneus) considerably longer than second joint of antennæ; cuneus with the basal and outer margins subequal in length; membrane considerably passing the abdominal apex, with a distinct basal cell; posterior femora moderately thickened, posterior tibiæ spinulose.

Idatius priscillianus, sp. n.

Black; eyes black; antennæ with the basal joint brownish ochraceous, second joint black, with its basal area brownish ochraceous, third and fourth joints palely fuscous, basal area of third ochraceous; cuneus with two greyish spots near base; membrane pale fuliginous; body beneath black; legs ochraceous, posterior femora castaneous, the spinules to the posterior tibiæ and the apices of the tarsi black; pronotum and scutellum shining black, faintly transversely striate; corium obscurely pilose and finely punctate; other structural characters as in generic diagnosis.

Length 3 mm.

Hab. Bengal; Paresnath, 4000 to 4500 ft. (*Annandale*). Simla Hills; Dharampur, 5000 ft. (*Annandale*).

SEJANUS, gen. nov.

Head about as long as broad, deeply, broadly, roundly, foveately sulcate between the eyes, which are large and project beyond the anterior margins of the pronotum; antennæ with the first and second joints moderately thickened, the second more robust than the first, which is short and about the length of the eyes, second joint about five times the length of first, third and fourth slender, third about twice as long as first, fourth as long as first; rostrum robust and reaching the posterior coxæ; pronotum twice as broad as

long, the lateral margins oblique, posterior margin subtruncate; scutellum somewhat large and triangular; corium (excluding cuneus) about as long as second joint of antennæ, cuneus with the basal and outer margins subequal in length, angularly narrowed at apex; membrane considerably passing the abdominal apex with a single basal cell; legs mutilated in typical specimen.

This genus is founded on a single specimen sent me by Mr. Green from Ceylon, and although wanting the legs cannot be left out of the enumeration of the Capsidæ of British India.

Sejanus funereus, sp. n.

Black; eyes castaneous brown; antennæ with the basal joint brownish ochraceous, the second joint black, with its basal area brownish ochraceous, third and fourth joints stramineous; cuneus with two basal greyish spots; membrane fuscous, the margins paler; rostrum black, its basal area brownish ochraceous; body beneath black; corium shortly, finely, palely pilose; structural characters as in generic diagnosis.

Length $2\frac{1}{2}$ mm.

Hab. Ceylon (*Green*).

This species was contained in some miscellaneous sweepings kindly collected for me by our helpful friend Mr. E. E. Green.

SABACTUS, gen. nov.

Head about as long as broad, deflected and narrowed in front of eyes, which are transverse and strongly project beyond the anterior margins of the pronotum; antennæ slender, first joint shorter than head, second about four times as long as first, third longer than fourth and together distinctly shorter than second; rostrum reaching the posterior coxæ; pronotum at base twice as broad as long and about two and a half times as broad as anterior margin, moderately convex, deflected anteriorly, the basal margin before scutellum truncate, oblique towards posterior angles; scutellum subtriangular; corium (excluding cuneus) as long as second joint of antennæ, including clavus and cuneus twice as long as broad, cuneus considerably broader than long; posterior femora moderately thickened, intermediate and posterior tibiæ spinulose.

A genus to be placed near *Campylomma*, Reut.

Subactus institutus, sp. n.

Brownish ochraceous; eyes, a small spot at apex of claval suture, and the apex of cuneus black; antennæ ochraceous,

third and fourth joints palely fuscous; lateral areas of corium and the cuneus pale ochraceous; membrane pale fuliginous, the margins pale ochraceous; body beneath and legs ochraceous, intermediate and posterior tibiæ finely spotted with black, the spinules black; structural characters as in generic diagnosis.

Length 3 mm.

Hab. Ceylon; Peradeniya (*Green*).

IV.—*Descriptions and Records of Bees*.—XXIV.

By T. D. A. COCKERELL, University of Colorado.

Ashmeadiella howardi, sp. n.

♀.—Length about $5\frac{1}{2}$ mm.

Similar to *A. gillettei*, Titus, but smaller, the femora and tibiæ entirely black; ventral scopa white; tegulæ amber-colour; fifth and sixth dorsal abdominal segments pruinose, with fine white hair. The first three abdominal segments are red, the rest black, abruptly contrasting; the abdominal hair-bands are white and distinct.

♂.—Resembles the female, but flagellum black beneath, and first three abdominal segments red only at sides. The end of the abdomen has the usual four teeth; the median ones quite long and pallid, the lateral triangular and oblique. The wings are slightly dusky.

Hab. ♀ (=type), San Gabriel Mts., Los Angeles County, California, 3000 feet, June 16, 1909 (*F. Grinnell, Jr.*); ♂, Pasadena, California, May 31, 1909 (*F. Grinnell, Jr.*).

This is evidently the species discovered by Dr. L. O. Howard at La Mesa, California, in April 1898, referred to by Mr. Titus in *Proc. Entom. Soc. Washington*, vol. vi. p. 100.

Alcidamea grinnelli, sp. n.

♀.—Like *A. simplex* (Cresson), except that the mesothorax is much more regularly and evenly punctured, the tegulæ are pellucid testaceous, and the wings are darker, especially in the region about the stigma. Mandibles tridentate; flagellum ferruginous beneath; ventral scopa white; first r. n. entering second s. m. about as far from base as second from apex. The eyes are pale brownish and much narrower than in *Ashmeadiella meliloti* (Ckll.).

Hab. San Gabriel Mts., near Pasadena, California, 1750 feet, July 15, 1909 (*F. Grinnell, Jr.*).

Chelostoma jacintanum, sp. n. (*Cephalapis*, subgen. nov.).

♂.—Length a little over 8 mm.

Black (including the legs) except the sides of the first two abdominal segments, which are chestnut-red, the red more extensive on the base of the first; *head and thorax very densely and minutely punctured*, and with quite abundant white hair; *head large, quadrate, with very broad cheeks and vertex*, which are covered with appressed hair; face covered with white hair; clypeus very densely and minutely punctured, faintly carinate, *the lower margin very obtusely angularly produced in the middle, and with a minute denticle at each side*; mandibles hairy basally, faintly reddish toward apex, tridentate, *the two apical teeth prominent, the third separated by a long interval* and easily overlooked; *antennæ short, like those of a normal female of this group*, the flagellum faintly reddish beneath; *eyes large, very prominent*, green; *ocelli large, in a low triangle*; area of metathorax shining; tegulæ shining, rufo-testaceous. Wings reddish hyaline; *stigmatic part of marginal cell only about half as long as that bounding first submarginal*; *b. n. not quite reaching t.-m.; second s.m. with first r. n. joining it nearer, but not much nearer, its base than second r. n. its apex*, the distance of first r. n. from base hardly half length of first t.-c. Legs normal, small, joints of anterior tarsi ferruginous and of second slightly so; hind femora bulging at base below; hind spurs pallid, *simple*; pulvillus large. Abdomen shining, rather sparsely punctured; hind margins of first five segments with narrow white hair-bands; *basin of first segment not bounded by a transverse carina*; *seven dorsal segments*; sixth with the margin reddish hyaline, with a very low obtuse tooth on each side; seventh black, *produced into two large broad truncate teeth*, the interval between them about as great as the breadth of one; *five ventral segments visible*, fringed with pale hair, the fifth emarginate, the disk of the second with punctures running in transverse rows.

Hab. Kenworthy, San Jacinto Mts., California, 5000 feet, June 8 (F. Grinnell, Jr.).

In Robertson's table of Trypetine genera (Trans. Am. Ent. Soc. xxix. p. 167) this runs out at 2, but on the whole comes nearest to *Alcidamea*. It is far from being a typical *Chelostoma*; by reason of the characters italicized it may be regarded as the type of a new subgenus or genus *Cephalapis*. It is, perhaps, nearer to *Proteriades* than to *Chelostoma*.

Halictoides mulleri, Ckll., 1898.

This species was described from a single female. At Pasadena, California, April 8, 1909, Mr. Grinnell caught an insect which must be its male, having all the essential characters of the species, including the strongly bluish vertex, the broad head, &c. It is remarkable for the hind legs, of which the femora and tibiæ are greatly swollen (the latter also curved), while the flattened shining basitarsus is exceedingly short and broad, and broadly truncate apically. The flagellum is quite thick, with the apical two-thirds ribbed beneath.

Hesperapis semirudis, sp. n.

♀.—Length about $10\frac{1}{2}$ mm.

Black, with dense entire creamy-white hair-bands on the apical margins of the abdominal segments; hair of head and thorax rather dull white, *long and black on vertex*; mesothorax and scutellum with short greyish hairs, giving a dusty effect, around their margins, and *scanty erect black hairs on the disk*; face (and especially vertex) shining, but mesothorax, scutellum, and large basal area of metathorax dull and minutely roughened; flagellum stout, dull reddish beneath; tegulæ blackish anteriorly, hyaline testaceous posteriorly. Wings dusky hyaline, stigma dull ferruginous, nervures fuscous; b. n. falling some distance short of t.-m.; second s.m. long, narrowed more than half to marginal, receiving first r. n. a trifle nearer base than second to apex; third discoidal cell with its apical angle much less than a right angle. Legs black, ordinary, the hind legs carrying much light yellow pollen; hind spurs white. Abdomen with a sericeous surface; in addition to the apical hair-bands there are thin basal ones; hind coxæ with a small apical tooth or spine on inner side.

Related to *H. eumorpha* (Ckll.) and *H. rhodocerata* (Ckll.), but easily known by the thoracic sculpture and large amount of black hair.

Hab. Kenworthy, San Jacinto Mts., California, 5000 feet, June 8 (*F. Grinnell, Jr.*).

Diandrena puthua, sp. n.

♂.—Length about $6\frac{1}{2}$ mm.

Green; similar to *D. nothocalaidis*, Ckll., except that the hair of the face is wholly white, without any black; the eyes are rather broader and very prominent; the size is rather less; the spurs are white; and the area of metathorax has no

central raised line. The apical abdominal plate is broadly truncate, with rounded corners; its colour chestnut-red, with the apical margin broadly whitish.

♀.—Length about $6\frac{1}{2}$ mm.

Similar to the male except for the usual sexual differences; flagellum ferruginous beneath except at base (in the male it is dark); hind margins of abdominal segments pale testaceous; third antennal joint as long as the next three combined; clypeus densely covered with shining white hair; facial foveæ linear, black. The hind legs are covered with white hair, but it hardly seems to amount to a polleniferous scopa (no pollen has been collected), and there is no curled basal floccus.

Can the insect be parasitic? The female is totally distinct from *D. nothocalaidis* and *D. chalybea* by its small size, lack of black hair, &c. The first abdominal segment is shining in the female, dull in the male. In both sexes the process of labrum is bituberculate.

Hab. Pasadena, California, April 8, 1909, 2 ♂, 1 ♀ (*F. Grinnell, Jr.*).

The specific name, from the Malay, means white-haired. Judging from appearance, this seems to be a species which has adopted parasitic habits, in agreement with which the female (large in the pollen-collecting allies) has degenerated to the size of the male, and has lost its special polleniferous scopa. At the same locality, on the same day, Mr. Grinnell took *Andrena prunorum*, Ckll., two males.

Epeolus asperatus, sp. n.

♀.—Length about 8 mm.

Black, with the usual ornamentation, pale yellowish cinereous; mandibles red except at tips; labrum black, reddish laterally; clypeus black, very densely punctured; head much broader than long; eyes pale purplish; vertex rugoso-punctate; antennæ black, second joint dull reddish toward apex; mesothorax and scutellum rough with extremely dense punctures; scutellum bigibbous, the lateral teeth black and very short; lower two-thirds of pleura bare, densely punctured; tubercles red, but covered with hair; tegulæ bright apricot-red; anterior part of mesothorax with two curved bands of pubescence and one joining them, making a letter **H**. Wings with the apical margin broadly dusky; nervures and stigma piceous; second t.-c. reduced to a small stump on both sides, so that there are only two submarginal cells. Abdomen deep black, with all the bands widely interrupted

in the middle; on the first segment the lateral portions of the black area are truncate, and about as long as the median portion measured by the interruption of the apical band; on the second segment the band gradually broadens laterally, with indications of an oblique notch; on the third and fourth the band is divided into two patches on each side, the inner one oval, the outer on the third subquadrate, with a pointed projection directed inwards, and on the fourth more or less hourglass-shaped; fifth segment with only an apical lunule; last ventral not prolonged or curved downwards. Legs black, with the knees, apices of tibiæ, and small joints of tarsi ferruginous; hind spurs dark, somewhat reddish.

On account of the ornamentation of the abdomen it closely resembles *Triepeolus verbesinæ* (Ckll.). The venation would almost put it in *Phileremus*, but it is not very near to other species so referred.

Hab. Los Angeles, California, April 24, 1909 (*F. Grinnell, Jr.*).

Triepeolus gabrielis, sp. n.

♂.—Length about 7 mm.

Black, with the usual ornamentation, which dorsally, especially on the abdomen, has a yellowish tinge, but on the face, pleura, &c. is white; mandibles ferruginous; labrum and clypeus black, the former with two little tubercles near its lower edge; clypeus densely and minutely punctured; eyes brown, converging below; antennæ black, third joint slightly reddish; vertex coarsely rugoso-punctate; mesothorax and scutellum coarsely and very densely punctured; pubescent mark on anterior part of mesothorax forming a large reversed U, of which the basin is about half filled in and the edges flare outwards a little; scutellum hardly bigibbous, the lateral teeth black and very short; pleura hairy all over, but in the middle the hair is denser, making a sort of broad white band; tubercles and tegulæ apricot-red. Wings broadly dusky on apical margin; marginal cell so blunt as to be practically truncate; second s.m. narrowed almost to a point above. Femora with short silvery hair; legs black, the femora at extreme apex, tibiæ at apex and base, and tarsi ferruginous; spurs light ferruginous. Abdomen with the ground-colour intense black and the bands broad, that on first with a rather wide interruption, on second and third with a linear interruption, on fourth and fifth entire; black area on first segment a broad band, obliquely truncate but with rounded corners at sides; upper edge of light band on second segment with a double curve on each side, the lateral enlargement

gradual; second and third ventral segments with much white tomentum, those beyond the third dark.

Hab. San Gabriel Mountains, near Pasadena, California, 1750 feet, July 15, 1909 (*F. Grinnell, Jr.*).

The size and general appearance is like that of *T. noræ*, Ckll., but the new species is easily separated by the colour of the legs, the marking of the second abdominal segment, &c.

At the same locality, on the same day, Mr. Grinnell took *Bombus vosnesenskii*, Rad.

PSEUDOMELECTA, Radoszk.

This genus was based on certain Asiatic species in which the scutellum is bituberculate and the hair of the thorax is short, as in *Crocisa*. The American species of the group of *M. miranda*, Fox, are very distinct from true *Melecta*, and I had some idea of separating them under a new generic name, but I believe they may be correctly referred to *Pseudomelecta*. The ornamentation of the abdomen is *Epeolus*-like, and the five-jointed maxillary palpi are very small; for particulars concerning the mouth-parts see Ann. & Mag. Nat. Hist., July 1902, p. 45. Genuine *Melecta* is much more like *Bombomelecta* than *Pseudomelecta* in appearance, and even in scutellar structure. I have examined the mouth-parts of *M. armata*, Panz., and find them to be similar to those of *Pseudomelecta miranda*, but the maxillary palpi, though five-jointed, are quite long (970 μ), while those of *P. miranda*, a bee of about the same size, are only about 425 μ . The hyaline area of the maxillary blade is much broader in *M. armata* than in *P. miranda*. Thus *Melecta* (which does not occur in America) falls exactly between *Bombomelecta* (exclusively American) and *Pseudomelecta* (Asiatic and American). Of these, *Bombomelecta* is the most primitive, having very long six-jointed maxillary palpi, while *Pseudomelecta* is the most advanced. The group probably originated in America, migrated to Eurasia, and finally gave back to America the much modified type *Pseudomelecta*. The American forms of the latter genus are:—

Pseudomelecta californica (Cresson).

Pseudomelecta californica miranda (Fox).

Pseudomelecta interrupta (Cresson).

Pseudomelecta interrupta fallugiae (Ckll.).

Pseudomelecta interrupta rociadensis (Ckll.).

Pseudomelecta pasadenensis, sp. n.

♀.—Length about 12 mm.

Agreeing with *P. californica miranda*, except as follows:

a tuft of black hair below each antenna, and a large tuft above (in *miranda* and *californica* the tuft above is always white); middle tufts of black on anterior part of mesothorax large and not taking the form of stripes; tegulæ finely punctured, very dark, only the edges reddish; points of scutellar lobes not so close together; tarsi all black; marginal cell less truncate; first abdominal segment with the band more widely interrupted; no light spots on basal declivity. Perhaps only a subspecies of *californica*.

Hub. Pasadena, California, April 30, 1909 (*F. Grinnell, Jr.*).

The characters of the claws and mandibles, cited by Patton and Fox as distinctive of *Bombomelecta*, are also found in true *Melecta*.

Ceratina acantha, Provancher, 1895.

Mr. H. S. Smith, in Trans. American Ent. Soc. xxxiii. p. 121, has stated that *C. acantha*, of which he examined the female type, is identical with *C. submaritima*, Ckll. In this I think he is mistaken, owing to the failure to separate a distinct species common in Los Angeles County, California, to which the name *acantha* properly applies. The female *submaritima*, of which I have seen many examples, has no light mark on the clypeus; whereas Provancher's description calls for such a mark, and it is present in a species agreeing well with the description, taken by Mr. Grinnell in some numbers at Pasadena, April 8, May 21 and 31, and Aug. 26. The females, except for the dark tubercles and strongly dusky wings, are much like *C. nanula*, Ckll. Fortunately there are two males, noteworthy for the following characters: yellow mark on clypeus with the lateral projections much larger than the median, the latter faintly or decidedly bifid; labrum with a large pale yellow mark; front a fine deep blue; thorax strongly bluish; tubercles dark; wings strongly dusky; abdomen blue-green; apical plate with the terminal process broader than Smith figures for *acantha*, though not so broad as *nanula*, and slightly angled or pointed at the apex.

This is certainly distinct from *submaritima*, though related. The type of *acantha* was from Los Angeles. Mr. Grinnell took a small female *submaritima* in Arroyo Seco Cañon, San Gabriel Mts., California, October 8.

A female *C. nanula* was taken by Mr. Grinnell in Arroyo Seco Cañon, June 17. Although this has light tubercles, the wings are darker than usual in *nanula*, so I hesitated whether to regard it as a variety of *C. acantha*. I observe, however,

that the occipital region is more developed in *nanula* than in *acantha*; and as this condition is even rather exaggerated in Mr. Grinnell's specimen, I place it with *nanula*.

Ceratina tejonensis, Cresson.

This species, based on a single male from Fort Tejon, California, seems to be extremely rare. What I take to be its female was obtained by Mr. Grinnell at 3000 ft. in the San Gabriel Mts., California, June 16. It has dark tubercles like *acantha*, but it is much larger (8 mm. or a little over); the wings are strongly dusky, and the clypeus has a cuneiform ivory-coloured mark. The whole insect is very much darker and bluer than *C. neomexicana*, Ckll. The pleura is very strongly and coarsely punctured.

Megachile chrysopyga, Smith, 1853.

A cotype from F. Smith's collection, with the locality-label "Australia," is identical with my *M. maculariformis*. The description of *chrysopyga* disagrees with the specimens in respect to the ventral scopa and apparently the abdominal bands; it is just possible that typical *chrysopyga* (from Tasmania) is separable.

Prosopis polifolii, Ckll., 1901.

Mr. Grinnell has taken this in some numbers at Pasadena, California, April 8, 1909. The males vary, some having a black line on each side of the clypeus, between it and the lateral marks. The female, not previously known, is very much like *P. tuertonis*, Ckll., but has the face rather broader. Sometimes the tegulæ have no light spot, and the lateral face-marks are extremely narrow.

Prosopis hesperiphila, sp. n.

♂.—Similar to *P. polifolii*, but differing thus: supra-clypeal mark represented by a hardly visible transverse line (probably not constant); clypeus broader; lateral marks truncate above and strongly notched by antennal sockets. Wings dusky; marginal cell very narrowly obliquely truncate at apex; second s.m. broader; tegulæ with a light mark. The mesothorax is extremely densely and minutely punctured, and the face-markings are of the palest possible shade of yellowish.

Hab. Tahquitz Valley, San Jacinto Mts., California, 8000 ft., July 21 (*F. Grinnell, Jr.*).

A female taken at the same time and place proves to be only *P. polifolii*.

Prosopis pasadenæ, sp. n.

♂.—A very small species, in every way related to *P. mesillæ*, Ckll., but distinguished by the upward extensions of the lateral face-marks, which, instead of being short and broad, are long and slender, curving away from the orbits. The tubercles are variable, dark or spotted. Unlike the *P. digitata* group, the outer margin of the lateral face-marks is even, without any notch or angle at the beginning of the upward process. The first abdominal segment is very shiny, the second dullish.

♀.—Like that of *P. cressoni*, Ckll., but the wings greyish ; or when the clypeus is not entirely dark, like that of *P. mesillæ* in its darker forms, but lateral face-marks pointed above, away from orbit, and upper margin of prothorax all black.

Hab. Pasadena, California, April 8 to May 31 (*F. Grinnell, Jr.*) ; near Pasadena, at 1100 ft., July 21 (*F. Grinnell, Jr.*).

V.—*New Species of Diptera in the Collection of the British Museum.* By GEOFFREY MEADE-WALDO, B.A.

(Published by permission of the Trustees of the British Museum.)

PART I.

DURING a recent rearrangement of this family in the National Collection I have found a number of species which are apparently undescribed ; of these species I have now written descriptions, which I hope to publish in two or three consecutive papers.

In the present paper there are descriptions of new species of the families Masaridæ and Eumenidæ (as far as the genus *Rhynchium*).

All measurements of length are taken from the front of the head to the apical margin of the second abdominal segment, except where the *total* length is expressly mentioned.

The types are all in the National Collection.

DIPLOPTERA, Latr.

Masaridæ, Leach.

Key to the Genus *Paragia*, Shuckard.

- A. Median segment produced into spines at posterior angles.
- a. First recurrent nervure interstitial with first transverse cubital nervure *P. maculata*, sp. n.
 - b. Both recurrent nervures received by second cubital cell.
 - a². Wings without a fuscous band along the costa.
 - a³. Wings flavo-hyaline, broadly fuscous at apex *P. walkeri*, sp. n.
 - b³. Wings pale flavo-hyaline, radial cell fuscous *P. morosa*, Sm.
 - b². Wings stained with fuscous along the costa.
 - a³. Second abdominal segment mostly orange.
 - a⁴. Second abdominal segment with small black mark at base *P. calida*, Sm.
 - b⁴. Second abdominal segment with narrow black fascia at base *P. excellens*, Sm.
 - b³. Second abdominal segment almost or quite black.
 - a⁴. Median segment wholly orange *P. sobrina*, Sm.
 - b⁴. Median segment nearly or entirely black.
 - a⁵. Median segment entirely black.
 - a⁶. Basal half of third abdominal segment black *P. odyneroides*, Sm.
 - b⁶. Third abdominal segment almost entirely orange.
 - a⁷. Scutellum entirely black *P. bidens*, Sauss.
 - b⁷. Scutellum marked with orange. *P. prædator*, Sauss.
- b⁵. Spines of median segment orange.
 - a⁶. Segments 4-6 of abdomen almost entirely black. *P. nasuta*, Sm.
 - b⁶. Segments 4-6 of abdomen with orange fasciæ *P. venusta*, Sm.
- B. Median segment rounded or not produced into spines at posterior angles.
- a. Angles of the median segment subtuberculate, colours black and reddish orange.
 - a². Scutellum totally reddish orange.
 - a³. First abdominal segment reddish orange. *P. concinna*, Sm.
 - b³. First abdominal segment black; a small reddish-orange spot on each side. *P. deceptor*, Sm.
 - b². Scutellum reddish orange on posterior margin only *P. pictifrons*, Sm.
 - b. Angles of median segment rounded.
 - a². First abdominal segment as broad as second; colours black and yellow.
 - a³. Abdomen wholly yellow *P. decipiens*, Shuck.

- b*³. Abdomen black and yellow.
*a*⁴. Scutellum yellow, segments 1-4 of abdomen broadly yellow on sides. *P. tricolor*, Sm.
*b*⁴. Scutellum black, segments 2-5 of abdomen with narrow yellow fasciæ on apical margin *P. saussurei*, Sm.
*b*². First abdominal segment narrower than second.
*a*³. Abdomen banded with orange-yellow, second segment black *P. magdalena*, Turn.
*b*³. Five basal abdominal segments with narrowly interrupted yellow lines *P. vespiformis*, Sm.

P. australis, Sauss., and *P. bicolor*, Sauss., are not included in the above key, as I have not seen specimens of them, and the descriptions are too short to render their inclusion possible.

PARAGIA, Shuckard.

Paragia maculata, sp. n.

♀. Black; a spot on the clypeus, in the sinus of each eye, behind the eyes, the anterior margin and posterior angles of the pronotum, the tegulæ, except at the base, a large spot on the mesopleuræ below the base of each fore wing, a spot on the anterior angles of the scutellum, a vertical mark on each side of the median segment, a band on the apex of the first abdominal segment, broadening at the sides, a median series of transverse spots, lateral transverse lines on each side of segments 2-5, a spot on ventral surface of second abdominal segment, orange-yellow. Mandibles, the legs, a spot on the tegulæ at the base, ferrugineous. Tibiæ and tarsi of legs densely covered with a greyish-white pubescence on the outside. Wings hyaline; costa, radial, first cubital cell, and nervures fuscous; second cubital cell not receiving both recurrent nervures, but first recurrent nervure interstitial with first transverse cubital nervure. Clypeus subtriangular, depressed and truncate at the apex, with a median longitudinal carina; pronotum broadly rounded in front; scutellum prominent, covering postscutellum, median segment truncate, apical angles produced to a sharp point. Abdomen elongate-ovate, first segment distinctly narrower than second, strongly constricted at apex.

Punctured, thorax and vertex of head rugosely, clypeus and abdomen minutely, truncation of median segment transversely rugulose, with a median carina.

Total length 12 mm.

♂. Similar, orange-yellow spot on clypeus larger than in female, markings in general more yellow.

Total length $10\frac{1}{2}$ mm.

Hab. Western Australia; 1 ♀, 3 ♂.

Paragia walkeri, sp. n.

♂. Reddish orange; mandibles at apex, a small area on front round the base of each antenna, mesonotum and tegulæ, pleuræ (except a quadrate spot on mesopleuræ on each side), apical $\frac{2}{3}$ of second and whole of third abdominal segments, black.

Wings flavo-hyaline, fuscous at apex, especially in the radial cell. Clypeus wider than long, narrowly truncate at the apex; pronotum slightly arched on the anterior margin; scutellum prominent, strongly convex, and overhanging the postscutellum, median segment truncate, a massive tubercle on each side. Abdomen: first abdominal segment broadly cup-shaped, rather narrower than the second, following segments elongate-ovate. Head and thorax evenly studded with small granular puncturations, two furrows on mesonotum converging posteriorly, the abdomen most minutely punctured. Fulvous pubescence on vertex of head, thorax, legs, and abdomen (except segments 2 and 3).

Total length 20 mm.

Hab. Adelaide River, Northern Territory, Australia; 1 ♂, collected by Commander J. J. Walker during cruise of H.M.S. 'Penguin.'

This splendid species most strikingly resembles the insects of the Eumenid genus *Abispa*, Mitchell. None of the other described species of *Paragia* have similar wing-coloration, the flavo-hyaline ground-colour and fuscous apical area of *P. walkeri* rendering the likeness between the two genera extraordinary.

JUGURTIA, Sauss.

Jugurtia escalerae, sp. n.

♀. Black; the apical half of clypeus, the sinus of each eye, a broad band between the eyes, a line behind them, basal portion of mandibles, scape of antennæ, the flagellum below, the pronotum in front, broadening on the sides, a line on each side of the posterior margin reaching to the tegulæ, a spot in the centre of the mesonotum, the tegulæ, the apex of the scutellum, the postscutellum, two large marks (one oval, the other linear and curved) on mesopleuræ on each side,

Ann. & Mag. N. Hist. Ser. 8. Vol. v. 3

the entire median segment, with the exception of two black pipe-shaped marks placed back to back, a band on the apex of segments 1-5 broadening laterally, apical half of segment 6 totally, ventral surface of segments 1-5 (with exception of a small black spot on each side of segments 2-5), an oval mark on segment 6, the legs entirely, sulphur-yellow.

Apex of mandibles, flagellum of antennæ above, a spot on the tegulæ ferrugineous. Vertex, pronotum in front, covered with a short dense pile.

Wings clear hyaline, a slight shade of fuscous in radial cell, the nervures fuscous. The clypeus deeply emarginate at the apex, broadly subtriangular; pronotum rounded in front; scutellum very prominent, rounded, covering the postscutellum; median segment truncate, rounded.

Abdomen elongate-ovate, slender. Punctured; the clypeus, vertex, and thorax coarsely, scutellum very coarsely, median segment very finely rugulose, the abdomen more finely punctured.

Total length 8 mm.

Hab. S.W. Persia (*Escalera*); 4 ♀.

This species seems very nearly allied to *J. chlorotica*, Mor., from Transcaspia, but differs in several respects. The ventral surface of *J. chlorotica* is black, whereas the general colouring of the ventral surface of *J. escalerae* is sulphur-yellow, and there are other conspicuous differences in coloration. The disparity in size is also worthy of note, *J. escalerae* being a considerably larger species.

Eumenidæ, Westwood.

RHAPHIDOGLOSSA, S. S. Saunders.

Rhaphidoglossa punctata, sp. n.

♂. Black; the clypeus, a transverse spot between the eyes, the lower angle of the sinus of eyes, scape of antennæ beneath, a line on anterior margin of pronotum broken in the middle, two small spots on postscutellum, two spots rather larger on each side of apex of median segment, a small triangular mark on each side of first abdominal segment, second abdominal segment distinctly, segments 3-6 more obscurely marked with transverse lines on apical margin, tibiæ on outside, creamy yellow. Apical margin of second abdominal segment on ventral surface creamy yellow. Mandibles at the apex, segments 2, 3, 4 of the antennæ, a spot behind each eye, tegulæ, a minute spot on mesopleuræ on each side, an arched carina on the extreme apex of first

abdominal segment, base of second segment, the legs (except the coxæ), ferrugineous.

Wings hyaline, somewhat diffused with fuscous on the apical area. Clypeus as broad as long, with a small semi-circular emargination at the apex; pronotum sharply angular in front; mesonotum posteriorly with a longitudinal carina, obscure and shining; scutellum prominent, postscutellum with a minute spine on each side, median segment with a distinct longitudinal furrow.

Abdomen: the first segment as long as thorax, slender, broadening gradually to apex, second segment cup-shaped.

Punctured; the clypeus and whole thorax very coarsely and rugosely, first abdominal segment less coarsely, remaining segments minutely.

Length 10 mm.

Hab. Angola (*J. J. Monteiro*); 1 ♂.

Has a strong resemblance to *R. natalensis*, Sm., from Natal, but differs in having no tubercles on the petiole, and in the coarser puncturation of the petiole. It may possibly prove to be the male of *R. natalensis*, although the distance separating the two species geographically is very great.

Calligaster turneri, sp. n.

♀. Black; two small round spots on pronotum on each side ferrugineous; tibiæ and tarsi of intermediate and posterior legs covered with a dense short fulvous pile, the vertex and clypeus with a sparse grey pubescence. Clypeus as broad as long, subtriangular; pronotum narrow anteriorly, widening to the tegulæ; scutellum flat, median segment rounded posteriorly, with a conspicuous longitudinal depression between the two sides, punctured; clypeus, mesopleuræ, and mesonotum longitudinally striate, a short longitudinal carina between the antennæ, vertex rugosely, scutellum and postscutellum coarsely punctured, two longitudinal furrows on mesonotum; an obscure furrow on scutellum and postscutellum; abdomen shining, petiole more finely, following segments minutely punctured, an arched keel on apical end of petiole, a distinct transverse furrow anterior to it.

Wings pale fuscous, with a metallic-bronze gloss.

Length 15 mm.

Hab. Shillong, Assam (*R. E. Turner*).

Easily distinguished from the nearly allied species by the shape of the petiole, which is much shorter and more ovate than in any other species with the exception of *Calligaster 3-maculatus*, Cam., from Darjeeling; in both of these species

the petiole is not much more than twice as long as broad. It differs from *C. 3-maculatus* in the absence of any ferrugineous band on the apex of the petiole, and in the less coarse puncturation from *C. himalayensis*, Cam., which is an altogether larger insect, with a long depressed petiole; from *C. interstitialis*, Cam., in the absence of any yellow markings; and from *C. etchellsii*, Cam., in the absence of a tooth on the apex of the first abdominal segment and in the shape of the petiole.

LABUS, SAUSS.

Labus annulatus, sp. n.

♀. Black; a small transverse mark at the base of the clypeus, a spot on each angle of the anterior margin of the pronotum, a minute spot on the tegulæ, a band on the apex of the petiole and of the second abdominal segment, the anterior femora beneath, pale yellow. Tegulæ, anterior tibiæ, ferrugineous. Head and thorax, segments 2-6 of abdomen, more or less covered with a short brown pubescence. Wings fusco-hyaline, the costa ferrugineous. Clypeus as broad as long, depressed and broadly rounded at the apex, with two obscure teeth; vertex with a longitudinal depression; pronotum broad in front, the anterior angles forming sharp points; mesonotum flattened posteriorly, a short longitudinal carina running along the surface, median segment convex, with apical angles produced to a point on each side, divided by a longitudinal furrow. Petiole of abdomen as long as thorax, slender, gradually broadening towards the apex, second abdominal segment cup-shaped.

Punctured; head and thorax (with exception of median segment) coarsely, median segment and abdomen shining and sparsely punctured.

Length 7 mm.

♂. Differs from female in having the clypeus and scape of antennæ on underside yellow.

Hab. Durban (*F. Muir*); 2 ♀, 4 ♂.

Nearly allied to *Labus* (?) *macrostylus*, Kohl, from Sierra Leone; both species have petioles of the same form. They may be distinguished by the clypeus, which is convex and slightly emarginate at the apex in *L. ? macrostylus*, neither of which characters occurs in *L. annulatus*.

Labus superbus, sp. n.

♂. Black; clypeus, the scape in front, a small line behind the eyes, the anterior margin of the pronotum broadening on

each side, the tegulæ, two spots on the scutellum, the post-scutellum, a longitudinal mark on each side of the median segment, a spot on each side of petiole, a band on the apical margin of petiole broken in centre, a large elongate-ovate spot on each side of second abdominal segment, the apical margin of second abdominal segment, a band on the apical margin of segments 3, 4, 5, continued on the ventral surface, the legs, except the coxæ and trochanters and in posterior legs the femora, bright orange-yellow. Apex of mandibles, terminal segment of flagellum, the costa of wings, ferrugineous.

Clypeus shallowly and widely triangularly emarginate; pronotum rounded, narrower in front than behind, median segment depressed and arched. Petiole as long as thorax, much attenuated at apex, second segment elongate-ovate.

Punctured; head (except clypeus), thorax, and abdomen coarsely. The whole head and thorax and the first abdominal segment with a greyish-white pubescence.

Length 8 mm.

Hab. White Nile; 2 ♂.

Labus punctatus, sp. n.

♂. Black; the scape of antennæ beneath, a line on pronotum in front broken in the middle, apex of petiole above and second segment dorsally and ventrally yellow; mandibles at the apex, tegulæ, apex of femora, the tibiæ and tarsi of anterior legs, intermediate tibiæ and tarsi, base of posterior tibiæ, ferrugineous.

Wings hyaline; costa, radial cell, and stigma ferrugineous; the whole insect more or less covered with a pale pile.

Clypeus subtriangular and convex; pronotum square, angular on the anterior margin; mesonotum and scutellum gradually rounded, postscutellum sharply raised to form two teeth, median segment rounded posteriorly. Petiole of abdomen rather shorter than thorax, widening somewhat abruptly towards the apex; second abdominal segment cup-shaped.

Punctured; head, thorax, and petiole coarsely, remaining segments of abdomen more finely.

Length 7 mm.

Hab. Kangra Valley, 4500 feet (*G. C. Dudgeon*); 1 ♂.

Closely resembles *L. armatus*, Cam., from Khasia Hills, but may be distinguished by several differences in the colour-pattern, viz. absence of yellow on scutellum, clypeus, and tegulæ. *L. punctatus* is considerably more coarsely punc-

tured, particularly on the petiole. Differs from *L. humbertianus*, Sauss., by the coarser puncturation.

DISCOELIUS, Latr.

Discoelius carinatus, sp. n.

♀. Black; a small spot between the antennæ, a band on the apical margin of the petiole dorsally, a broad band on apical $\frac{2}{3}$ of second abdominal segment, the following segments dorsally, anterior tibiæ, ferrugineous red. Head, thorax (especially the median segment) with sparse short grey pubescence. Wings fusco-ferrugineous. Clypeus convex, ovate; mandibles broad; vertex broader than pronotum, which is produced to a sharp point at each angle of the anterior margin; median segment truncate, slightly concave. Abdomen: the petiole short, the swollen apical portion as broad as long, slightly constricted at the apex, the remaining segments elongate-ovate.

Punctured; mandibles and clypeus very coarsely, the head and thorax deeply, sides of median segment striate. Mesonotum with four longitudinal furrows, the two central furrows longer than the others; scutellum traversed by a longitudinal furrow; abdomen more finely punctured.

Length 12 mm.

Hab. Victoria (*C. French*); 1 ♀.

Strongly resembles *D. verreauxi*, Sauss., in coloration, but is easily distinguished by much slenderer form of the thorax and the conspicuous row of carinæ on the mesonotum, besides which there are differences in the colour-pattern. The length of the thorax serves to distinguish this species from all the described species of this genus from Australia.

ELIMUS, Sauss.

Elimus, Sauss., Et. fam. Vesp. vol. i., Eumen. p. 7.

Ischnocoelia, Perkins, Proc. Haiw. Ent. Soc. 1908, p. 32.

Saussure makes no mention of the fact that *Elimus* has two calcaria on the intermediate tibiæ and the tarsal claws bidentate. Both of these characters are applicable to *Ischnocoelia*, which appears identical in other respects to *Elimus*, and thus sinks as a synonym to the older genus.

Elimus ferrugineus, sp. n.

♂. Black; the clypeus, antennæ (with exception of the scape beneath), mandibles, a spot in the sinus of each eye, the pronotum (except the posterior angles), the tegulæ, a

small oval spot on mesopleuræ on each side, a transverse line on the scutellum, the petiole, and segments 2, 4, 5, 6, 7 of the abdomen, the legs (with exception of coxæ and trochanters), ferrugineous. Wings clear hyaline, costa and nervures ferrugineous. Scape beneath yellow.

Clypeus slightly broader than long; prothorax narrow in front, considerably more narrow than vertex of head, widening considerably at the posterior angles; median segment slightly concave medially, rounded posteriorly. Petiole of abdomen of almost even thickness throughout, slightly constricted at base and apex; second segment of abdomen cup-shaped.

Head and thorax throughout evenly and deeply punctured, the abdomen more finely punctured, the mesonotum longitudinally traversed by two shallow furrows.

Length 10 mm.

Hab. S. Australia; 2 ♂.

Elimus mackayensis, sp. n.

♀. Black; two longitudinal marks on the sides of the clypeus, a minute spot above the insertion of each antenna, a small spot in the sinus of the eyes, a spot behind each eye, the pronotum in front, posterior margin of the tegulæ, the transverse keel of the postscutellum, two minute spots on the apex of the petiole, narrow border to apical margin of each of the following abdominal segments, yellow. Mandibles, the scape, second and third joints of the antennæ, apex of femora, tibiæ and tarsi, tegulæ in front, petiole of abdomen at base and apex, ferrugineous. Wings clear hyaline, slightly fuscous on the costa; the stigma and nervures testaceous; second cubital cell subtriangular.

The clypeus truncate, as broad as long, median segment strongly depressed, the apical angles produced into spines; petiole as long as the thorax, constricted at the ends.

Punctured; head and thorax deeply and evenly. Mesonotum traversed longitudinally by two shallow sulci; abdomen shining, minutely punctured.

Length 11 mm.

Hab. Mackay, N. Queensland (*R. E. Turner*).

♂. Strongly resembles the female, but differs in the following respects:—Mandibles and clypeus yellow; terminal joint of antennæ bent back in a hook; clypeus with a shallow emargination at the apex; second abdominal segment much narrower than in female.

Nearly allied to *E. australis*, Sauss., which it strongly

resembles in colour, but may be distinguished by the more slender petiole and differences in the distribution of the markings.

Elimus robustus, sp. n.

♀. Black; the mandibles at the base, two oval spots at the base of the clypeus, scape, a spot in the sinus of each eye, a spot on each side behind the eyes, the pronotum, a spot on the mesopleuræ on each side, tegulæ, two spots on the posterior margin of scutellum, two obscure marks on median segment behind, petiole of abdomen along the sides and at apex, second abdominal segment at base and a broad band on the apical margin, the legs (with exception of coxæ and trochanters), ferrugineous. Wings pale hyaline, slightly ferrugineous along the costa.

Clypeus subtriangular, rather broader than long, median segment strongly depressed, a distinct carina along each side, petiole as long as thorax, following segments elongate-ovate.

Punctured; the head and thorax (except median segment) coarsely, median segment and abdomen minutely; two carinæ converging posteriorly on mesonotum. More or less covered with a pale pubescence, most noticeable on clypeus, vertex, median segment, and the tibiæ.

Length $12\frac{1}{2}$ mm.

Hab. S. Australia; 2 ♀.

Elimus arabicus, sp. n.

♀. Black; antennæ, mandibles, clypeus at apex, pronotum, tegulæ, the petiole along the sides and beneath, second abdominal segment at base, legs (with exception of tibiæ above), ferrugineous brown. Tibiæ above, narrow band interrupted above in centre on apical margin of petiole, abdominal segments 2-5, pale yellow.

Wings clear hyaline, slightly fuscous along the costal margin, second abscissa of the radius about $\frac{1}{4}$ as long as the third. Clypeus broader than long; thorax massive; petiole as long as thorax, tapering gradually towards apex; second abdominal segment petiolate at base.

Punctured; head and thorax coarsely, abdomen more finely, apex of median segment on each side produced to form a sharp up-curved process. Dense grey pubescence on head, thorax (except mesonotum), and abdomen, giving the insect a dusty appearance.

Length 14 mm.

Hab. Tajura, Straits of Bab-el-Mandeb; 1 ♀.

All the other described species of this genus are from Australia.

This insect is rendered very conspicuous by the denseness of the pubescence, which gives it the appearance of being covered with a bloom, as on grapes, when looked at from a little distance.

EUMENES, Fabr.

Eumenes assamensis, sp. n.

♀. Black; a spot between antennæ, pronotum in front, apex of tegulæ, postscutellum, petiole at the apex, a narrow band on apical margin of second abdominal segment, a small spot on each side of it, a few marks on legs, dull brick-red.

Wings fusco-hyaline, costa and radial cell dark fuscous.

Clypeus broadened from the base, greatest width about half as long as length, produced and narrowed towards apex, convex, a slight emargination at apex. Pronotum narrow and rounded anteriorly, median segment rounded posteriorly; petiole of abdomen as long as thorax, of uniform width, very slender at the base, depressed along the dorsal surface; second abdominal segment arched when viewed laterally. The whole insect coarsely punctured, with the exception of abdominal segments 3-6.

Clypeus covered with a dense silvery pile; vertex of head, the thorax, and abdomen more sparsely covered.

Length 12 mm.

Hab. Shillong, Assam (*R. E. Turner*); 2 ♀, 4 ♂.

♂. Rather smaller, the last joint of antennæ bent back on penultimate joint.

Length 10 mm.

Very nearly allied to *E. punctata*, Sauss., described from China, a species occurring also in Sikkim and Burma, in which the markings are yellow. Mr. Turner, who collected for some months in the neighbourhood of Shillong, tells me that the brick-red markings are a characteristic feature of the insect fauna in that region. In addition to the species here described, he captured specimens of an *Odynerus* and of the fossorial genera *Cerceris* and *Crabro*, of *Cælioxys* among the Apidæ, also specimens of a saw-fly. Had not living individuals been observed, it might have been surmised that a damp cyanide bottle had caused a discoloration.

Eumenes nicobarica, sp. n.

♂. Black; clypeus, sinus of the eyes, pronotum in front, disk of mesonotum with two short lines running longitu-

dinally, and two transverse curved lines above them, mesopleuræ, outer margin of tegulæ, two spots on scutellum, postscutellum, median segment (except for a black mark in shape of a Maltese cross), petiole with a pair of short yellow lines on each side at base and a pair about centre, a transverse band at apex, yellow. Whole of second abdominal segment (with exception of base, a minute black spot on dorsal area, and narrow transverse band on posterior margin) yellow. Segments 3, 4, 5 black, with subapical margins yellow, interrupted narrowly above and broadly below; segment 6 with a yellow spot on each side above. Anterior tibiæ yellow above.

Length 24 mm.

Hab. Nicobar Islands; 3 ♂.

Probably a geographical race of *Eumenes arcuata*, Fabr., as there does not appear to be any structural difference between the two species. The insect would come next to *E. arcuata* in Bingham's key ('Fauna Brit. India,' Hymenoptera, vol. i. p. 335). The second abdominal segment is most conspicuously marked with yellow, and renders identification possible at a glance.

Eumenes ovalauensis, Sauss.

Belonogaster bidentata, Kirby, Ann. & Mag. Nat. Hist. (5) xiii. p. 410 (1884) (Fiji).

Described as a female, is a male of *Eumenes ovalauensis*, Sauss. The genus *Belonogaster* appears to be confined to Africa, Madagascar, and Japan.

Eumenes waltoni, sp. n.

♀. Black; a narrow line behind the eyes, pronotum in front, postscutellum, apical margin of petiole above, conspicuous elongate oval mark on each side of second abdominal segment, a broad band on apical margin of second abdominal segment regular above, uneven on the ventral surface, tibiæ and tarsi yellow. Apex of mandibles and flagellum of antennæ ferruginous beneath.

Clypeus subtriangular, truncate, somewhat depressed at the apex, broadest part of thorax considerably broader than vertex, median segment rounded posteriorly, slightly depressed. Petiole of abdomen short and fairly stout, second abdominal segment about as broad as thorax at the tegulæ.

Punctured: vertex of the head, thorax, median segment,

and petiole coarsely and evenly; clypeus, second and following segments shining and minutely punctured.

Wings hyaline, golden brown along the costa, pale fuscous at the apex.

Vertex of the head, thorax (especially the hinder parts), and the petiole with a long pile of pale fuscous hair.

Length 16 mm.

♂. Smaller; clypeus whitish yellow, antennæ black.

Length 14 mm.

Hab. Khamba Jong, Sikkim (15,000–16,000 ft.); Gyangtse, Tibet (13,000 ft.). Collected by H. J. Walton on the Tibet Expedition, 1903–4; 18 ♀, 2 ♂.

Eumenes higletti, sp. n.

♀. Black; clypeus, mark between antennæ at base, a line behind them, pronotum almost reaching to tegulæ, large ovate spot (interrupted in the centre) on mesopleuræ on each side, posterior margin of postscutellum, median segment broadly on each side, apical margin of the petiole on each side, apical margin of second abdominal segment, except medio-dorsally, and two small isolated spots, apical margins of segments 3, 4, 5 (interrupted dorsally and continuous ventrally), yellow. Anterior femora and tibiæ on outside, base of intermediate and posterior tibiæ, yellow. Antennæ beneath, two quadrate spots on scutellum, tegulæ, metapleuræ on each side, petiole medially, apical segment of abdomen, legs (except where yellow), ferrugineous. Wings hyaline, tinted with a golden sheen towards costal area, radial cell fuscous. Clypeus broadly ovate, truncate at the apex, rather longer than broad; pronotum angular in front; median segment truncate, produced towards apex on each side to form a V-shaped depression; petiole rather longer than thorax, slender, the apical portion broader, a small tubercle on each side, following segments elongate-ovate. Punctured; vertex and thorax finely and evenly; mesonotum with a short longitudinal carina, not reaching the middle; petiole and abdomen shining anteriorly, petiole very minutely and sparsely punctured.

Vertex of head and median segment with a dense grey pubescence.

Length 17 mm.

Hab. Tamsoo, Gold Coast (*G. A. Higlett*); 1 ♀.

Eumenes nigratarsis, sp. n.

♂. Black; clypeus, the lower part of the sinus of each

eye, a mark at base of antennæ, pronotum, a small spot on disc of mesonotum on each side, yellow; mandibles, joints 1-6 of antennæ, line behind the eyes, a long mark on mesopleuræ on each side, postscutellum behind, median segment (except a longitudinal mark in centre), petiole (except the base, a small spot on upper surface near apex), second abdominal segment ventrally and laterally, abdominal segments 3-6 on apical margin, the whole ventral surface of abdomen, legs (with the exception of trochanters, tarsi, and posterior femora on the inside), ferrugineous.

Wings golden hyaline, slightly fuscous in radial cell and on the apical area. Clypeus broadened from the base, greatest width rather more than half the length, truncate, produced and narrowed towards apex. Petiole long and very slender, as long as thorax, gradually widening towards apex, a small spine on each side. Following segments of abdomen elongate-ovate. Punctured; vertex and thorax evenly and finely, second abdominal segment finely striate. Terminal joints of antennæ gradually increasing in size towards the apex, terminal joint forming a hook.

Length 20 mm.

Hab. Port Darwin, N. Queensland (*G. Turner*), 1 ♂; Dec. 1902.

Nearly allied to *E. latreillei*, Sauss., and *E. bicincta*, Sauss., but differing from them in the much slenderer petiole, and in the ferrugineous bands on the apical margin of the abdominal segments.

Eumenes (Pareumenes?) australensis, sp. n.

♂. Black; clypeus, scape of antennæ beneath, sinus of the eyes, a line behind the eyes on each side, large quadrangular mark between antennæ at base extending back along the vertex, pronotum reaching back to tegulæ, a large ovate spot on mesopleuræ on each side, a minute spot on the tegulæ, two large median quadrate spots and a small spot on each anterior angle of scutellum, a large elongate yellow mark on median segment on each side, an irregular broken line on apex of petiole above, apical margin above and a conspicuous mark at the base of second abdominal segment on each side, third and fourth abdominal segments dorsally, yellow. Anterior and intermediate femora and tibiæ yellow. Flagellum of antennæ and tarsi ferrugineous. Wings hyaline, with a pale golden effulgence, rather more conspicuous along the costal area; second abscissa of radial cell very short, about $\frac{1}{5}$ as long as the third. Clypeus broadly ovate, truncate at the base,

deeply emarginate at the apex, median segment truncate, divided longitudinally by a narrow furrow; scutellum flat. Petiole of abdomen as long as thorax, very slender at base, gradually widening towards the apex; second abdominal segment about twice as broad as petiole at apex. Punctured slightly on vertex of head; the whole insect shining, sparsely covered with testaceous pubescence.

Length 10 mm.

Hab. Cairns, N. Queensland, April 1902 (*R. E. Turner*); 3 ♂.

All the specimens were captured on one flowering bush at Kuranda, about 14 miles from Cairns, at an elevation of 1100 feet.

Intermediate between *Eumenes* and *Pareumenes* as defined by Saussure, Et. fam. Vesp. Suppl. p. 133. It resembles *Pareumenes* in the form of the petiole, but the tubercles are only indicated by minute swellings on each side. This is the first described Australian species with any tendency towards *Pareumenes*.

PAREUMENES, SAUSS.

Pareumenes marshalli, sp. n.

♀. Black-pruinose; mandibles, clypeus, sinus of eyes, cheeks, vertex, pronotum, mesopleuræ in front, tegulæ, hinder part of scutellum and of postscutellum, sides of median segment and the surface of the truncation partially, petiole at base and ventro-laterally, basal half of second abdominal segment, segments 4, 5, 6 of abdomen, dark ferrugineous brown.

Antennæ, legs, dark ferrugineous brown.

Four narrow longitudinal lines on petiole, two on the ventral surface, two on the dorso-lateral surface, and narrow band on apex of petiole, a mark on hind femora outside, yellow.

Wings hyaline, tinged with fuscous on the fore wing towards apex; costal area flavo-hyaline.

Head, thorax, abdomen, and legs covered with short dense whitish pubescence, long and conspicuous on the surface of the truncation of the median segment.

Clypeus rather longer than broad, narrowly produced towards apex, terminated in two small teeth, intervening area transverse. Mandibles deeply toothed. Thorax robust; pronotum in front as wide as head, widening towards tegulæ; scutellum flat, traversed by a slight longitudinal keel, median

segment oblique, with sharply defined lateral margins, apical angles spined. Petiole robust, widening gradually towards apex; a tubercle on each side near the base; a furrow running longitudinally on the dorsal surface towards apex; second abdominal segment pyriform, following segments normal.

The whole smooth, impunctate, except for a few shallow punctures on apical margin of abdominal segments 2 and 3.

Length 16 mm.

Hab. Salisbury, Mashonaland, Sept. 1900 (*G. A. K. Marshall*); 1 ♀.

Dedicated to the donor.

This insect appears to be the first *Pareumenes* described from Africa, the other species being principally Indian.

Eumenes imperatrix, Smith, described from Northern China, and *E. pictifrons*, Smith, from Celebes, should also be placed in the genus.

KATAMENES, gen. nov.

Head as in typical *Eumenes*; mandibles long, not dentate, sharply pointed. Antennæ massive, hooked at apex. Maxillary palpi 6-jointed; joints 1, 2, 3 long, subequal; joint 4 half as long as third joint, joints 5 and 6 very short, together as long as fourth, *joints 5 and 6 articulated to joint 4 below the apex*. Labial palpi 4-jointed. Petiole as long as thorax and median segment, slender at base, apical half swollen, constricted at apex. *Claws of tarsi simple*. One spur, very obscure and rudimentary, on intermediate tibiæ, situated on the inner side. 1 ♂.

In general superficial appearance strongly resembles *Eumenes*, but has a peculiar look owing to the heavy, thickly built antennæ, which seem large in proportion to the insect, and to the long, somewhat abruptly broadened robust petiole. The articulation of the two terminal joints of the maxillary palpi to the fourth joint below the apex seems to be analogous to the terminal joints in the labial palpi of some genera of bees, such as *Megachile*, &c.

Katamenes watsoni, sp. n.

♂. Black; clypeus, mandibles, except the extreme apical points, scape beneath, a narrow line behind each eye, the cheeks, pronotum in front, broadening laterally, scutellum in front, the postscutellum, two marks on mesopleuræ on each side, apical margin of petiole, and an apical band on segments 2-6 of abdomen, both dorsally and ventrally,

anterior and intermediate tarsi and tibiæ, yellow. Apex of mandibles, a mark on the clypeus, flagellum, except the terminal 5 segments, tegulæ, sides of median segment, petiole, except base, and a median dorsal mark shaped like a reversed T, a broad band round the centre of second abdominal segment, anterior and intermediate femora, a mark on anterior and intermediate tibiæ on the outside, posterior legs totally, ferrugineous. Wings clear hyaline, slightly fulvous along costa. Clypeus rather longer than broad, truncate at base and apex, broadest in centre, narrowly produced towards apex; pronotum slightly narrowed anteriorly, obtuse-angled at sides; median segment truncate, slightly arched, the apical angles forming a V-shaped hollow; petiole about as long as thorax, very slender at base, rather abruptly increasing medially, slightly constricted towards the apex, second abdominal segment elongate-ovate.

Head, thorax, and petiole covered with distinct, even, punctures; clypeus and remaining segments of abdomen impunctate. Covered with a greyish-white pubescence; long on cheeks, vertex, and median segment; short and dense on abdomen and clypeus.

Length 16 mm.

Hab. Peshawur (*E. Y. Watson*); 1 ♂.

MONTENUMIA, Sauss.

Montezumia pulchella.

Gayella pulchella, Sm. Journ. Proc. Linn. Soc., Zool. ii. 1857, p. 108.

Smith's species, described from Borneo, is certainly not a *Gayella*. The only two known species of *Gayella* are both from Chile.

Montezumia burmanica.

Montezumia burmanica, Bingham, Hym. Brit. India, vol. i. (1897).

Montezumia bisulcata, Cameron, Ann. Mag. Nat. Hist. (7) vol. vi. p. 535 (1900).

Cameron's species from Khasia is indistinguishable from *M. burmanica*, which ranges through to China.

Cameron says "allied to *M. burmanica*, Bingham," but gives no points of difference.

Montezumia wallacei, sp. n.

♀. Black; a small spot at the base of the mandibles, two minute spots between the antennæ, the scape faintly beneath,

two conspicuous marks on median segment, yellow. Head and thorax bluish black, abdomen jet-black. Wings suffused with a dark purple effulgence. Tibiæ and tarsi covered with a short, thick, golden pubescence, almost yellow in some lights. Clypeus subtriangular truncate; mesonotum with two short and conspicuous longitudinal furrows, median segment with a deep medial longitudinal groove widening at the apex, the apex on each side produced to form a small emargination with conspicuous teeth on each side, sides of median segment forming ridges. Petiole of abdomen flat dorsally, a small tubercle on each side beneath. Punctured; head, pronotum, mesonotum in front, and part of petiole rather coarsely granular, rest of thorax and abdomen (except petiole) minutely and sparsely punctured, petiole coarsely striate on dorsal surface.

Length 22 mm.

Hab. Sumatra (*A. R. Wallace*); 1 ♀.

Seems to be rather nearly allied to *M. orientalis*, Grib., from Pulo Laut, but differs in having the head coarsely granular and in many respects in colour-pattern. The two curious emarginations on the apex of the median segment are quite peculiar to the species.

NORTONIA, SAUSS.

Nortonia gilberti, Turner.

Euchalcomenes gilberti, Turner, Trans. Ent. Soc. 1908, p. 90.

The mouth-parts are those of a normal *Nortonia*, a fact noticed by Turner after his description was in the press.

Pachymenes viridis, Smith, Journ. Proc. Linn. Soc. Lond., Zool. vol. iii. p. 163, from Key Island, and *P. elegantula*, D. T., Cat. Hym. vol. ix. p. 23, from Batchian, stated by Turner as belonging to the genus *Euchalcomenes* consequently come into *Nortonia*.

Thus the genus *Euchalcomenes*, Turner, sinks as a synonym of *Nortonia*.

Nortonia elegans, Smith.

Eumenes elegantula, D. T. Genera Insectorum, fasc. 19, Hymenoptera, Vespidae, p. 22.

Pachymenes elegans, Smith, Journ. Proc. Linn. Soc. Lond., Zool. Suppl. p. 131 (1860).

Nortonia viridis, Smith.

Pachymenes viridis, Smith, Journ. Proc. Linn. Soc. Lond. vol. iii. p. 163 (Aru).

Nortonia rechbergi.

Nortonia viridis, Schulthess-Rechberg, Ver. zool.-bot. Ges. Wien, vol. liii. p. 362 (1903), New Guinea.

The species from New Guinea described by Schulthess-Rechberg under this name consequently sinks to the older species described by Smith in 1859. I propose that it should be renamed *Nortonia rechbergi*, in honour of the author.

ABISPA, Mitchell.

Abispa australis, Smith, Cat. Hym. Brit. Mus. vol. v. p. 42.

The type is here stated to be a female, but the type-label is under a male. The sexual difference in the clypeus is marked; the two teeth on that of the male are sharp and distinctly prominent, whereas in the female they are blunt and hardly perceptible.

Abispa paragioides, sp. n.

♂. Reddish orange; mesonotum posteriorly, second abdominal segment (except apical margin), black. Mesonotum dark ferrugineous anteriorly. Wings flavo-hyaline, fuscous at the apex, darkest in radial cell. Clypeus rather longer than broad, narrowly produced towards apex, which is emarginate; scutellum with an inconspicuous longitudinal furrow, postscutellum divided from it by a considerable fissure, a blunt tubercle at each end; median segment truncate and medially depressed, the apical angle on each side produced to form a spine. Abdomen elongate-ovate, first abdominal segment rather narrower than the second; with a shallow longitudinal furrow. Punctured; head and thorax finely, median segment coarsely, and abdomen minutely.

Length 18 mm.

Hab. Port Darwin, Northern Territory, Australia (*Gilbert Turner*); 2 ♂.

Distinguished from *A. australis*, Sm., from Port Essington, which has 3-tuberculate postscutellum, and the base of the first abdominal segment black; from *A. ephippium*, which also has the postscutellum 3-tuberculate and the clypeus more broadly emarginate; and from *A. splendida* in the form of the clypeus and general distribution of colour.

The resemblance between the insects of this genus and *Paragia walkeri* has been mentioned under the description of that species, but between no two species is the likeness

more remarkable than between *P. walkeri* and *A. paragioides*, which certainly occur together, as Port Darwin is not more than 40 miles distant from Adelaide River.

RHYNCHIUM, Spinola.

Rhynchium hæmorrhoidale, Fabr., race *salomonis*, subsp. n.

♀. Black; antennæ, mandibles, spot behind each orbit, a small mark above insertion of antennæ. tibiæ and tarsi, ferrugineous. Wings flavo-hyaline. Clypeus subtriangular, narrowly truncate; pronotum rather slender anteriorly, widening towards the tegulæ; scutellum and postscutellum slightly arched, the latter overhanging the median segment, which is truncate, rounded laterally, and depressed medially. Abdomen with the first segment rather narrower than the second, about as broad as median segment. Head and thorax uniformly coarsely punctured, abdomen more finely, median segment with a series of small tubercles on each side, mesonotum with a short longitudinal carina running to the posterior margin.

Length 20 mm.

Hab. Solomon Islands (*C. M. Woodford*); 1 ♀.

This race most closely resembles specimens of *R. hæmorrhoidale* from Celebes and Ceram, but differs from them considerably in the amount of puncturation on the mesonotum and scutellum, and in the absence of any fuscous on the wings. The insect has a slender appearance when compared with typical *R. hæmorrhoidale*.

Rhynchium abispoides, sp. n.

♀. Reddish ferrugineous; two minute spots on the base of each mandible, a small spot behind the insertion of each antenna, mesonotum, tegulæ on the inside, median segment on hind surface, first abdominal segment at base, second abdominal segment, black. Wings flavo-hyaline, more golden towards costa, apical area fuscous. Tibiæ and tarsi covered with a short dense golden pile. Clypeus ovate, produced towards the apex and narrowly emarginate; pronotum square anteriorly, rather narrower than thorax at the tegulæ; scutellum and postscutellum separated by a conspicuous transverse furrow; median segment truncate and depressed medially, sides produced to form blunt angles. Clypeus longitudinally striate towards apex, a carina broadly V-shaped on vertex behind ocelli; thorax and abdomen finely and evenly punctured, two shallow longitudinal sulci on mesonotum, median segment transversely striate.

Length 14 mm.

Hab. Queensland (*F. P. Dodd*); Mackay, Queensland (*R. E. Turner*); Clare, S. Australia (*W. Wesché*).

Unlike any other described species of the genus from Australia, strongly resembles *Abispa paragioides* in general colour. The specimens from S. Australia differ from the Queensland individuals in having the vertex and mesopleuræ black. Some specimens from Swan River, W. Australia, resemble the South Australian form.

♂. Unknown.

VI.—Notes on Crustacea found in the Gizzard of a Deep-sea Cephalopod. By THOMAS SCOTT, LL.D., F.L.S.

[Plates II. & III.]

DR. W. E. HOYLE, the well-known authority on the Cephalopoda, when examining one of these organisms captured in deep water in the South Atlantic, discovered in its gizzard a number of fragments and one or two moderately whole specimens of small crustaceans, on which apparently the creature had been feeding some time before it was captured. The crustacean remains comprised several species, and included representatives of the Isopoda, the Amphipoda, and the Copepoda. Very few of them, however, were sufficiently perfect for identification, and one of these is a rather interesting species belonging to the Copepoda.

I am indebted to the Rev. T. R. R. Stebbing for the privilege of overhauling this somewhat curious collection, and also to my son Mr. Andrew Scott for the drawings which illustrate this paper and for assistance otherwise.

I have on several occasions found interesting Crustacea, not only minute Copepods, but tolerably big crabs, such as *Hyas*, *Pagurus*, *Geryon triden*, and full-grown Norway lobsters, in the stomachs of fishes, and in one case no fewer than fifty-four pairs of cuttlefish jaws were obtained in the stomach of a king-fish, *Lampris luna**, but I think this is the first time I have had the opportunity of examining a carcinological collection obtained in the stomach of a Cephalopod.

The Cephalopod referred to—*Stauroteuthis hippocrepium*, Hoyle †, was captured at a depth of 2425 fathoms in lat.

* See Twenty-first Report Fishery Board for Scotland, pt. iii. p. 219 (with a photograph of the jaws).

† See Bull. Mus. Comp. Zool. vol. xlii. no. 1, pp. 1-77 (with 12 plates).

66° 40' S., long. 40° 35' W., on March 10th, 1908. The contents of the gizzard of this Cephalopod, as stated above, consisted for the most part of fragments representing different species of Crustacea. Those belonging to the Isopoda and the Amphipoda have been examined by the Rev. Mr. Stebbing; he has sent me the following notes on the various forms, and has kindly permitted me to incorporate his notes here. I gladly avail myself of this permission, for the information they give appears to include all that can be satisfactorily made out concerning these forms. His notes are as follow:—

1. *The Isopoda.*

(1) "Fragments of a very spiny specimen which has uropods like those of Beddard's *Trichopleon ramulosum*, peduncle long, rami long, inner ramus with short second joint, telson produced to a rather long point. Beddard's *Eurycope spinosa* was without pleon, and therefore remains indefinite." *Trichopleon ramulosum*, Beddard, was described from specimens from the Philippines.

(2) "Another species may belong to *Ilyarachna*, Sars, or perhaps rather to *Echinozone*, Sars."

(3) "A small nearly perfect specimen seems near to *Nannoniscus*, Sars. The masculine appendage of the second pleopods ends in a broad oval expansion. The operculum is not abnormal as in *N. oblongus*, Sars, but is as in his Caspian species *N. caspius*."

2. *The Amphipoda.*

(4) "An Amphipod wanting the pleon." Neither the genus nor species of this could be satisfactorily determined.

(5) "Another Amphipod without the pleon, this being *Andaniotes corpulentus* (G. M. Thomson)." *Andaniotes corpulentus* was described from specimens collected in the South Pacific.

3. *The Copepoda.*

The Copepoda comprised an *Oithona* rather immature and scarcely perfect enough to be determined; a male *Eutерpe acutifrons*; another form too imperfect for identification; and one or two tolerably perfect specimens of *Pontostratiotes abyssicola*, G. S. Brady. The following short description of the *Pontostratiotes* is culled from that by

Dr. Brady in his Report on the Copepoda of the 'Challenger' Expedition, supplemented by a careful examination of the specimens from the stomach of the *Stauroteuthis*.

Family **Pontostratiotidæ**, A. Scott *.

Genus **PONTOSTRATIOTES**, G. S. Brady.

Pontostratiotes abyssicola, G. S. Brady.

(Pls. II. & III.)

1883. *Pontostratiotes abyssicola*, Brady, Report on the Scientific Results of the Voyage of H.M.S. 'Challenger,' Zool. vol. viii. p. 105, pl. xlv.

Description.—Anterior antennæ tolerably elongate, slender, and composed of eight joints; the first three are moderately elongated, but the second and third are each rather shorter than the joint that precedes it; the upper distal angle of the second joint is produced into a strong forwardly-projecting tooth; the remaining joints are small, but the fourth from the end is rather longer than the others. Posterior antennæ slender, two-branched; inner ramus elongated, outer short and four-jointed. Mandibles stout, armed with strong teeth and provided with a large two-branched palp. Maxillæ stout and furnished with several spiniform marginal bristles and long, rather slender setæ. First maxillipeds moderately elongate, stout, and bearing several setiferous processes on the inner aspect. Second maxillipeds smaller and composed of four joints, first joint considerably longer than the combined lengths of the other three, end-joints small, no terminal claw.

The first four pairs of thoracic legs with both rami three-jointed, outer and inner rami of about equal length; both rami of the first pair rather shorter than in the other three pairs, and an elongated spiniform seta springs from the inner angle of the second basal joint, and extends to near the end of the inner ramus.

The fifth pair consist each of a single, elongated, narrow, two-jointed branch, end-joint about five times longer than broad and provided with several long spiniform marginal and terminal setæ. Caudal rami, which are somewhat abnormal and resemble those of *Ægisthus*, Giesbrecht, are extremely long and slender and close together, and assume a setiform appearance.

The carapace is armed with several long and strong toothed spines, which are directed backwards.

* This family was instituted for *Pontostratiotes* and the nearly related genus *Ægisthus*, Giesbrecht: see Report on the Copepoda of the 'Siboga' Exped., by A. Scott, p. 232 (1909).

Length of the specimens scarcely 2 mm.

Pontostratiotes (the sea-soldier) appears to be a true bottom form; it was discovered by Dr. Brady amongst some mud brought up from a depth of over 2000 fathoms. Dr. Brady, in his remarks on this Harpactid, says:—"This wonderful species was found—but unfortunately one specimen only, and that in a dried state—amongst material taken in the tow-net at a depth of 2200 fathoms in lat. $37^{\circ} 29' S.$, long. $27^{\circ} 31' W.$ This single specimen was apparently much shrunk and distorted, owing to its having been dried amongst the mud in which it was taken, and on this account many of the details of structure have been very imperfectly made out. The tail-setæ, for instance, and the minor details of the mouth-organs were partly indistinguishable, the limbs much matted together, and the natural contours doubtless in other parts much altered." Notwithstanding that Dr. Brady had only one specimen, and that not in the best condition, his description is remarkably full and in accord with the specimens from the gizzard of the *Stauroteuthis*, and it is only because these specimens enable me, with my son's assistance, to supply some missing parts that I have ventured to supplement Dr. Brady's excellent description.

This curious species does not appear to have been met with since Dr. Brady's discovery of it in the 'Challenger' collections till now, and it is owing to Dr. Hoyle's interest in other departments of natural history besides his own that we are indebted for the opportunity of examining these specimens from a widely different locality from that where the species was first discovered.

EXPLANATION OF THE PLATES.

PLATE II.

Pontostratiotes abyssicola, Brady, ♀.

Fig. 1. Antennule, $\times 50$. 2. Second maxilliped, $\times 102$. 3. Foot of first pair of thoracic legs, $\times 76$. 4. Foot of second pair, $\times 72$. 5. Second thoracic segment, $\times 50$. 6. Third thoracic segment, $\times 50$. 7. Fourth thoracic segment, $\times 50$. 8. Caudal rami, $\times 72$.

PLATE III.

Pontostratiotes abyssicola, Brady, ♀.

Fig. 1. Antenna, $\times 38$. 2. Mandible and palp, $\times 103$. 3. Maxilla, $\times 103$. 4. Second maxilliped, $\times 103$. 5. Foot of third pair of thoracic legs, $\times 72$. 6. Foot of fourth pair, $\times 72$. 7. Foot of fifth pair, $\times 103$.

VII. — *Notes on Cleridæ and Descriptions of some new Genera and Species of this Family of Coleoptera.* By CHARLES J. GAHAN, M.A., of the British Museum (Nat. Hist.).

(Published by permission of the Trustees of the British Museum.)

HAVING been occupied for some months past in arranging the Cleridæ in the collection of the British Museum, I had necessarily to make myself pretty well acquainted with the characters on which the classification of the family is based and on which the relationship between the different genera is determined. The work of arrangement might have been simplified had I been content to follow the order set out in the latest general work on the classification of the family. But this was not to be. My work was not long in progress before I became dissatisfied with the order and arrangement of the genera adopted by my friend Herr Schenkling in the 'Genera Insectorum,' partly because I found a certain number of undoubted errors left uncorrected, and chiefly because the order of the genera did not seem to me in many cases to be in accordance with natural affinities.

Instead, therefore, of following his arrangement, I have endeavoured to place the genera in our collection in what appeared to me to be the most natural order; and the study which this entailed has enabled me to offer the following notes, criticisms, and suggestions for the consideration of other workers on the family. In one or two points they will be found to have more general bearing on the classification of the Coleoptera.

Types of Cleridæ in the Collection of the British Museum.

Herr Sigmund Schenkling has been good enough to describe several new species, the types of which are now in the British Museum; and it is due to him that I should express here my great indebtedness for the kind help he has given in identifying the greater part of the unnamed material sent to him for examination. These identifications, coming from so well-acknowledged an authority on the Cleridæ, have been of the greatest value to me, and have made my work much easier than it would otherwise have been.

The Museum is fortunate also in possessing now a large number of the *types* described by the Rev. H. S. Gorham. These came to it chiefly in the splendid collections from Central America presented by Dr. F. D. Godman and the late

Mr. Osbert Salvin, and in the almost equally valuable collection bequeathed to the Museum by the late Mr. Alexander Fry. A few of his types also were found in the Pascoe collection; and types or cotypes of species described by him are included in the valuable sets of Coleoptera, chiefly from Rhodesia and Natal, presented at different times by Mr. Guy Marshall.

Incorporated in the general collection of Cleridæ, there are to be found also *types* of species described by Newman, Adam White, Westwood (one or two), Andrew Murray (one), Chevrolat (a few Mexican types), G. Waterhouse, C. O. Waterhouse, Pascoe, and D. Sharp; while kept apart in separate cabinets are the types described by Wollaston, and those few from the Banks collection described by Fabricius.

The Classification of the Cleridæ.

Lacordaire, in his 'Genera des Coléoptères,' divided the Cleridæ into two main sections or tribes characterized as follows:—

1. Cinq articles aux tarses; pronotum confondu avec les parapleures du prothorax *Clérides vrais.*
2. Quatre articles aux tarses; pronotum distinct des parapleures du prothorax..... *Enopliides.*

The distinction thus drawn between the two tribes or subfamilies, though real, is not quite accurately stated and requires some explanation.

In all Cleridæ, with scarcely an exception, the tarsi are 5-jointed; but in many genera, and not alone those belonging to one subfamily, the first joint is very much reduced in size, even in some cases almost to the point of disappearance. It usually lies below the basal part of the second and cannot be seen when the tarsus is looked at from above. This apparently tetramerous condition is, however, not the one to which Lacordaire refers in the diagnosis given above. In the true Cleridæ, or those belonging to the subfamily Clerinæ, the fourth tarsal joint is normally developed, generally as large as the third, and, like it, furnished with a membranous lobe beneath; but in the Enopliides (or, as we should now call them, the Corynetinæ) the fourth joint is very small and inconspicuous, having almost the same relation to the other joints as it has in the so-called tetramerous Coleoptera. So small, as a rule, is this joint, that in many cases it has been entirely lost sight of, with the consequence that not a few genera of Cleridæ have been placed in the wrong subfamily.

Lacordaire's whole "groupe" Phyllobænides, for example, and other genera to which I shall have to direct attention are in this case.

With regard to the second of Lacordaire's distinctions between the Clerinæ and the Corynetinæ, this, more accurately stated, should be, that in the Clerinæ there is no lateral margin or carina on the prothorax, whereas in the Corynetinæ the prothorax almost invariably has either a lateral margin or carina, or at least shows some traces of it.

In no Cleridæ, and in no other beetles of the suborder Polyphaga with some few doubtful exceptions, have I ever seen any traces of the primitive sutures that separate the pronotum from the pleuræ of the prothorax. The presence of such sutures seems to be confined to the Adephaga, and constitutes, in my opinion, one of the most distinctive characters of that suborder; and here I may state that since I find these sutures present and very well marked in *Omma* and *Tetraphalerus*, two genera of Cupedidæ, I consider that much-debated family to be rightly placed in the suborder Adephaga.

Coleopterologists, myself included, very often in their descriptive writings refer to the lateral margin of the prothorax, when present, as marking the boundary line between the pronotum and the pleuræ. But there is no real justification for this practice. The lateral margin may, and in many cases probably does, coincide with the primitive dividing-line; but in the Polyphaga there is no means of telling, since the sutures have in nearly every case disappeared. If, however, we turn to the Adephaga, we find there that the sutures are generally placed at some distance below the lateral edge, and that the pronotum itself forms no inconsiderable part of the flanks of the prothorax, that part to which Leconte and Horn have given the name of *epipleura*. In the Cupedidæ the relative proportions of the pleuræ and the *epipleura* vary a good deal. The pleuræ in the two genera mentioned above are wide and form a good part of the sides of the prothorax, but in the genus *Cupes* itself they seem to be restricted to very narrow limits.

This leads to a question which has a direct bearing upon the classification of the Cleridæ. Is the presence or not of a lateral margin on the prothorax a matter of primary importance?

In some recently published systems of the classification of the Coleoptera, I find the Cleridæ of Lacordaire no longer maintained, but split up into two distinct families, the Cleridæ and the Corynetidæ. Since no details as to the

exact limits of the two families are given, I can only conjecture that this new view is the outcome of my friend Prof. Lameere's remarks concerning the Cleridæ in his 'Notes pour la Classification des Coléoptères,' published in 1900. "It is in effect quite impossible," he says, "to maintain the family Cleridæ as it is generally adopted at the present day." "The Corynetinæ having retained the lateral margin of the prothorax cannot be descended from the Clerinæ, which have lost it; on the other hand, the latter cannot be derived from the Corynetinæ, since they still possess a well-developed fourth joint in the tarsi." "It is manifest," he continues, "that the Clerinæ are descended from Melyridæ, and equally manifest that the Corynetinæ are also descended from Melyridæ, but from different Melyridæ though near akin to the ancestors of the Clerinæ."

I am not convinced by this argument. For while I admit it to be highly improbable (and not merely on the grounds stated by Prof. Lameere) that the Clerinæ are derived from the Corynetinæ, I see no reason why the latter may not be derived from the former. The lateral margin of the prothorax, even supposing it not to have been present in the predecessors of existing Clerinæ, may quite conceivably have arisen as a secondary development. It is often very much more fully developed in some of the later and more specialized groups of a family than it is in the more primitive ones. Compare, for example, the Cassidinæ with the Criocerinæ in the family Chrysomelidæ. There appears to me to be, on the whole, a much closer relationship between the Clerinæ and the Corynetinæ than there is between either and the Melyridæ; and this would hardly be the case if they were derived from different Melyrid ancestors, though possibly it might be explained on the theory of convergence of characters.

More plausible to me seems Prof. Lameere's further suggestion that all three—the Clerinæ, Corynetinæ, and Melyridæ—should constitute a single family. The characters that separate the Cleridæ from some at least of the Melyridæ are very slight, although perhaps not more slight than those which distinguish the Melyridæ from some of the Malacodermata. But I am afraid that Lameere's suggestion, if followed to its logical conclusion, might lead us too far, and so I prefer to regard the Cleridæ as a separate family constituted very much as it was left by Lacordaire, but with the exclusion of a few genera admitted by him, and the addition of a great number of genera described since his time.

The characters on which Lacordaire relied for the sub-

division of his Tribes into lesser groups seem to be amongst the best that could have been selected, and have since been made use of by Leconte and Horn in their 'Classification,' and more recently by Herr Schenkling in his work on the Cleridæ in Wytsman's 'Genera Insectorum.'

Some of Lacordaire's mistakes, resulting chiefly from inaccuracy of observation and not from any fault in his system, have been repeated in both of these works. These I shall have to point out, as well as other errors that have come under my notice; and I propose also to make some suggestions that will, I hope, lead to a more natural arrangement of the genera, especially in the group *Clerini*.

The subfamily Clerinæ was split up by Lacordaire into four groups: the Tillini, Clerini, Phyllobænini, and Hydnocerini. In the last three groups the first joint of the tarsi is supposed to be covered over by the second. But in the three genera *Phyllobænus*, Spin., *Epiphloeus*, Spin., and *Plocamocera*, Spin., forming his group Phyllobænini, the first joint of the tarsi is quite distinct, being nearly or quite as long as the second joint, while the fourth joint is very small. In these genera also the prothorax usually has a more or less distinct margin or carina on each side. The group should therefore be placed in the subfamily Corynetinæ. The peculiar character of this group—the emargination of the eyes placed on the inner side instead of in front—is to be met with again in certain genera now placed in the group Enopliini, so that the group Phyllobænini can no longer be maintained as a distinct one. The genus *Ellipotoma*, Spin., which is at present placed in the group Hydnocerini, must on the same grounds be removed to the group Enopliini of the subfamily Corynetinæ. The above-mentioned facts, so far as the genus *Phyllobænus* is concerned, have already, I find, been pointed out by Leconte and Horn ('Classification of the Coleoptera of North America'); but their observations on the matter have evidently escaped the notice of Mr. Gorham, Herr Schenkling, and other writers on the Cleridæ.

The following four genera also, now placed in the Clerinæ, must, on account of the small size of the 4th tarsal joint and other characters, be removed to the subfamily Corynetinæ:—

1. *Tarsostenus*, Spin.—The description Lacordaire has given of the tarsi in this genus is altogether inaccurate, as I have discovered from my own observations. His mistake, however, had already been found out long ago by Jacquelin

du Val, who, in the 'Genera des Coléoptères d'Europe,' has given a correct description and figure of the tarsi in *Tarsostenus*, and proposed that this genus, having no lateral carina to the prothorax, should constitute a new group intermediate between the Clerinæ and the Enopliinæ. It is remarkable that this correction and this new view in regard to the position of *Tarsostenus* should have escaped the notice of almost every subsequent worker on the Cleridæ. Reitter, so far as I can find, is the only one of them who seemed to be acquainted with the true structure of the tarsi in *Tarsostenus*. But he has placed the genus in the group Tillini. There is, however, in my mind no doubt that the true place for *Tarsostenus* is the subfamily Corynetinæ, where it has a very close ally in the genus *Paratillus*, Gorb. If a sufficient number of specimens of *T. univittatus*, Rossi, be carefully examined, there will be seen in most of them a rather smooth shining space, near the base, on each side of the prothorax, and, limiting this space above, a short carina. In *Paratillus* the structure is practically the same, the carina being only a little more distinct.

2. *Tarsostenodes*, Blackb., has the tarsal structure of the Corynetinæ, and, although possessing scarcely a trace of a lateral carina on the prothorax, must also, I think, on general grounds be placed in the Corynetinæ.

3. *Thanasimorpha*, Blackb.—In this genus the prothorax has a short lateral carina as in *Paratillus*, and the genus seems best placed between *Paratillus* and *Thriocera*.

4. *Mathesis*, Waterh.—This genus is so closely related to *Phymatophæa*, Pasc., that it can hardly be maintained as distinct. The type species, *M. quadriguttata*, Waterh., has, in fact, been subsequently described by Sharp as a species of *Phymatophæa*, viz. *P. hilaris*, Sharp; and a second very nearly allied species, *P. violacea*, Broun (nec Fab.), has also been referred to *Phymatophæa*.

Subfamily CLERINÆ.

The Group Tillini.—The distinctive character of this group rests upon the fact that the first joint of the tarsi is normally placed, so that all five joints are distinctly visible from above. In nearly all the genera of this group the acetabula of the front coxæ are closed behind, the closure being effected chiefly by the prolongation inwards of the epimeral lobes of the prothorax. These lobes meet or almost meet together in the middle line. But in *Callimerus*, Gorb., one

of the genera referred to the group, the acetabula of the front coxæ are more widely open behind than in any other genus of Cleridæ, the epimera not being in the least produced behind the coxæ. *Callimerus* differs also from other Tillini in the form and structure of the eyes and antennæ, these being more suggestive of what obtains in the Hydno-cerini. I think, therefore, that, notwithstanding the length and distinctiveness of the first tarsal joint, the genus has no close natural affinity with the Tillini, and should be regarded as the type of a separate group.

Gastrocentrum, Gorham.—To this genus the *Notoxus unicolor* of White belongs, the latter species being identical with *G. pauper*, Gorh., the type of the genus.

The *Tillus dux* of Westwood should also, I think, be referred to *Gastrocentrum*. It is in form and general structure very like *G. unicolor*, White, and agrees with it in having the basal tooth of the tarsal claws very small and obtuse, not sharp and distinct as it is in the genus *Tillus*.

Cylidroctenus, Schklg.—Herr Schenkling, who first characterized this genus, has placed it in the group Clerini immediately after *Tillicera*, Spin. He was wrong, however, in stating that it has the same kind of tarsi as *Tillicera*. The first joint of the tarsi is quite distinctly visible from above, especially in the hind tarsi, where it is quite as long as the second joint. The claws, moreover, are not simply appendiculate at the base as in *Tillicera*, but furnished with two teeth, a stout one near the base and a more slender one towards the apex, the kind of structure met with in *Tillus* and other genera of Tillini. The condition of the gula is also very much the same as in *Tillus*, so that I believe *Cylidroctenus* to be on the whole very nearly allied to *Tillus*; it ought certainly to be placed in the same group.

Strotocerus, Schklg. (1902), seems to be hardly distinct from *Diplophorus*, Fairm. (1887).

The Group Clerini.—In deciding upon the affinities of genera within this group certain characters, such, for example, as the structure of the antennæ, seem to me to have been taken too much into account, while others have been almost or quite neglected. I find that Lacordaire, Leconte and Horn, and Schenkling seldom or never mention the condition of the front coxal cavities, whether closed or open behind, in the genera they have characterized. And yet this condition has been made to play an important part in the classification of many other families of beetles. Leconte and Horn do, in fact, state in their definition of the

family, that the coxal cavities of the front legs are open ; but this only shows that they had neglected to observe the condition in a great many of the genera.

Another character not yet made use of in the classification of the Cleridæ, but which will probably yield some interesting results, is that which may be drawn from the variations in the form &c. of the gular area on the head. The gular sutures in some cases diverge posteriorly, so that the gula is distinctly broader behind. In *Tillus* and many other genera the gula is posteriorly divided off from the sides of the head by a more or less narrow slit on each side, and is continued back as a sort of free plate—a most unusual condition in Coleoptera. A further modification of the gula, characteristic of *Clerus* and those genera which, on other grounds, I consider to be most nearly related to *Clerus*, arises from the convergence of the sutures posteriorly, so that the gula becomes very narrow at its hinder end. Taking this character among others into consideration, I believe that the following genera constitute a natural subgroup within the group :—*Colyphus*, *Cleronomus*, *Systemoderes*, *Pæcilochroa*, *Blaxima*, *Enoclerus* (= *Clerus* of Schenkling), *Sallæa*, *Thanasimus*, *Tillicera*, *Clerus*, Fab., *Stigmatium*, *Operculiphorus*, *Dasyrocclusus*, *Rhytidoclerus*, *Xestonotus*, *Cyclotomocerus*, *Phæocyclotomus*, *Cardiostichus*, *Hemitrachys*, *Omadius*, and *Corynommadius*. Some of these genera are widely separated in Lacordaire's arrangement ; and the same is true, but to an even greater extent, of the arrangement followed by Herr Schenkling. This subgroup (in which the eyes are finely faceted and distinctly emarginate, the acetabula of the front legs open behind, the tarsal claws appendiculate at the base, and the last joint of the labial palpi alone triangular) might come in the second place, the first subgroup being constituted, as by Lacordaire, of those genera in which the eyes are coarsely faceted, namely, *Axina*, *Priocera*, *Phlæocopus*, *Notoxus* (= *Opilo*), *Thanasimodes*, *Natalis*, *Cormodes*, *Gyponyx*, *Xenorthrius*, *Orthrius*, *Aphelochroa*, and (?) *Erymanthus*. In the last genus the eyes are less coarse than in the others ; but yet not so fine as in any of the genera of the remaining subgroups, excepting perhaps *Thaneroclerus*, a genus to which I must again refer. In these genera of the first subgroup the eyes are as a rule feebly emarginate, sometimes almost entire ; the gular sutures diverge posteriorly ; the acetabula of the front coxæ are sometimes open, sometimes closed behind (in the latter case the prosternum is usually expanded behind

the coxæ) ; the tarsal claws usually simple, sometimes with a very small, generally obtuse, tooth at the base.

Although giving as the chief character of the group Clerini "eyes emarginate in front," Lacordaire included in the group one or two genera in which the eyes are almost, if not quite, entire. Other genera in which the condition is the same have since been added. *Thaneroclerus*, Lefebv., and its near ally *Neoclerus*, Lewis, are, from a systematic point of view, difficult to deal with, as they present exceptional characters : the first tarsal joint has almost disappeared, the next three joints are very short, and, except on the front tarsi, scarcely lobed beneath, and the claw-joint is long. In *T. buqueti*, Lefebv., the type of *Thaneroclerus*, the eyes, almost entire, are rather small and round, and coarsely faceted; the prothorax has on each side a distinct line or carina; the acetabula of the front coxæ are closed behind. *T. sanguineus*, Say, differs from it in having the eyes rather finely faceted, the acetabula open behind, and the prothorax without a trace of a lateral carina. The presence in *T. buqueti* of the lateral carina, of which a trace also appears in *Neoclerus*, suggests that these two genera should go in the subfamily Corynetinæ; but, on the other hand, the fourth tarsal joint is almost as well developed as the third. Until I can work out their affinities with more certainty, I must leave them as a separate subgroup in the Clerini. *Lyctosoma*, Lewis, which I do not know, will probably go with them.

Graptoclerus, *Blasiophthalmus*, *Allonyx*, and *Anthicoclerus*, though having the eyes entire or very nearly so, seem not out of place in the group Clerini and would form a small subgroup leading towards the next, in which the eyes are more or less distinctly emarginate, the gular sutures straight or divergent behind, the acetabula of the front coxæ generally open, the last joint of both labial and maxillary palpi triangular (with a few exceptions), the tarsal claws simple as a rule or having only a feeble tooth at the base. In the latter subgroup I should place the following genera:—*Platyclusus*, *Lissaulicus*, *Balcus*, *Aulicus*, *Phlogistus*, *Trogodendron*, *Olesterus*, *Scrobiger*, *Eburiphora*, *Zenithicola*, *Dieropsis*, *Trichodes*, and *Eleale*. In three of these genera, viz. *Platyclusus*, *Lissaulicus*, and *Eburiphora*, the acetabula of the front coxæ are closed behind, the prosternum being broad between the coxæ, and widely curved out on each side behind. These three genera occur in Madagascar, the rest, in which the acetabula are open behind, are, with the

exception of the American *Aulicus*, the African *Dieropsis*, and the Mediterranean *Trichodes*, peculiar to Australia and New Zealand, one genus only (*Balcus*) occurring in the latter country. *Cleropiestus*, Fairm., another genus from Madagascar, which Schenkling places in the group Hydnoceri, would, I think, go better in the present group near one of the three genera just mentioned. In the form of the prosternum, as well as in its wing-venation, it agrees closely with *Eburiphora*, whereas, except for its somewhat prominent eyes, it has little resemblance in form or structure to any of the Hydnocerini.

Calendyma, Lac., and *Epiclides*, Chev., the two remaining genera of those included by Lacordaire in the group Clerini, differ in some important respects from the other members of the group. The first joint of the tarsi is in both quite distinct, especially in the hind tarsi, where it is almost or quite as long as the second joint, and equally visible from above. If this character were alone to be considered, they ought to be included in the group Tillini; but Lacordaire probably preferred to risk destroying the accuracy and value of his synoptic tables rather than to violate natural affinities. For these two genera do seem on the whole much more nearly allied to certain genera of the present group than to any genus of Tillini; but they should, in my opinion, be placed as a distinct subgroup characterized as follows:—Five distinct joints to the tarsi, the first joint in the hind tarsi nearly or quite as long as the second; head rather narrow, prolonged anteriorly; eyes finely faceted, emarginate in front; front coxæ transverse with distinct trochantins, their acetabula widely open behind, the prosternum very narrow between the coxæ and not prolonged behind; last joint of labial palpi triangular, of maxillary subcylindrical, maxillary lobe long; tarsal claws simple or with only a feeble obtuse swelling at base. From this subgroup the numerous species constituting the genus *Eurycranus*, Blanch., must, however, be excluded. For some strange reason, Lacordaire and since both Gorham and Schenkling have regarded this genus as a synonym of *Epiclides*, Chev.; but it is altogether distinct, the only point in common being that the species are mostly Chilian. In *Eurycranus* the head is short, widened above, with the eyes prominent and almost entire, not at all like the head of *Epiclides*; the first tarsal joint is quite small and hidden below the second joint; and the rest of the characters are such that, except for a slight difference in the structure of the antennal club, there is no reason why this genus should not go in the group Hydnocerini, and there I propose to place it.

The Group Hydnocerini.—With the exclusion of *Ellipotoma*, Spin., which belongs to the next subfamily, and *Cleropiestus*, Fairm., which I have suggested should go in the group Clerini, the present group would now be composed of the following genera: *Euryceranus*, Blanch., *Hydnocera*, Newm., *Isolemidia*, Gorham, *Lemidia*, Spin., *Parmiis*, Sharp, *Neohydnius*, Gorham, *Cephaloclerus*, Kuw., and *Allelidea*, Waterh., with perhaps *Evenus*, Cast, *Abrosius*, Fairm., *Emmepus*, Motsch., and *Theano*, Cast., genera which are at present unknown to me. *Paupris*, Sharp, which is included in the group by Schenkling, is somewhat doubtfully to be placed there, owing to the coarse facetting of the eyes. But I do not at present know of a better place for this genus.

The genus *Thanasimodes*, Murray, which I have placed next *Notoxus*, Fab. (in the group Clerini), differs from the latter only in having the acetabula of the front coxæ completely closed in behind. The type, *T. metallicus*, Murray, a species from Old Calabar, is, I feel sure, identical with one from the same locality described later by Chevrolat, viz. *Opilo chloropterus*. *Opilo cyaneopurpureus*, Fairm., is closely allied to it, and there are other African species, including *dorsalis*, Lucas, *gigas*, Cast., and *nigerrimus*, Kraatz, now placed in *Opilo*, which agree with *T. metallicus* in having the front coxal cavities closed in behind, and would therefore be better placed in *Thanasimodes*.

It will be seen that I have substituted the name *Notoxus*, Fab., for *Opilo*, Latr.; and some explanation for this is necessary, and the reason also why I have proposed the new name *Enoclerus* for the genus characterized by Schenkling under the name of *Clerus* ('Genera Insectorum,' Cleridæ, p. 48, 1903).

On the Application of certain Generic Names.

The name *Clerus* was first proposed as a generic name by Geoffroy, but since Geoffroy did not in his first work make use of the binomial nomenclature he is no longer recognized as the author of this and of several other names that he was the first to employ. It appears that Fabricius was the first author who at the same time characterized the genus *Clerus* and made use of the binomial system, and he is therefore admitted to be the author of the genus *Clerus*. The species included by him in the genus at its first publication, Syst. Ent. p. 157 (1775), were in order as follows: *mutillarius*, Fab., *formicarius*, Linn., *sipylus*, Linn., and *apiarus*, Linn.

In an appendix appearing at the end of the same volume he added to the genus another species—*serguttatus*, Fab. These species are not all congeneric, and the question has arisen, which species is to be regarded as the type of the genus? In one of his papers, Mr. Gorham has rashly stated that Fabricius clearly indicated *formicarius* as the type. He did nothing of the kind. If there is any indication by Fabricius of the type, that type must be *mutillarius*; for in a later work—Syst. Eleuth. i. p. 279 (1801)—we find this species followed by a description of the generic characters, and it seems to have been a practice with Fabricius in some of his works to add the generic characters immediately after the species from which they were chiefly drawn. But the case for *mutillarius* does not stop here. Two of the original four species, the two last, were in the Syst. Eleuth. removed by Fabricius to the genus *Trichodes*. Of the four, there remained now only the two first. *Clerus formicarius* became subsequently the type of Latreille's genus *Thanasimus*, and then only *mutillarius* was left. Nearly half a century later *mutillarius* was made the type of another name—*Pseudoclerops*, Jacq. du Val. It is Herr Schenkling's contention that as all these four species have gone from the genus, we must now take the species of the supplement as the type. With this I cannot agree, for the simple reason that it is absurd to take as the type of a genus a species that was apparently unknown to the author at the time when he first described the genus. And so I am forced to maintain that *Clerus mutillarius*, Fab., is the type of the Fabrician genus *Clerus*.

Notoxus is another of those names first proposed by Geoffroy, but in which all the rights of priority have passed over to Fabricius. At present, the name is used for a genus of Heteromera, and it was obviously invented to express a character of that genus; but for a very long time it was applied to a genus of Cleridæ; and now, so far as I can see, we shall have to use it in that sense again, to take the place of *Opilo*, Latr. Fabricius (Syst. Ent. p. 158) applied the name first to two species—*mollis*, Linn., and *monoceros*, Linn. Later (Syst. Eleuth.), he placed *monoceros* in the genus *Anthicus*, while under *Notoxus* he has ranged the following species, all Cleridæ: *porcatus*, Fab., *violaceus*, Fab., *mollis*, Linn., *indicus*, Fab., and *chinensis*, Fab. Unless it can be shown that some other author had in the meantime used *Notoxus* in a different sense, it seems clear that we must take *mollis*, Linn., to be the type of that genus.

Subfamily *CORYNETINÆ*.

The principal character of this subfamily is the great reduction in size of the fourth joint of the tarsi; this joint is never lobed beneath and is usually so small as to be barely visible between the lobes of the third joint. The first joint undergoes the same modifications as in the first subfamily, being sometimes long and distinctly visible from above, while in other cases it is quite small and almost wholly hidden below the base of the second joint, the tarsi in such cases appearing to be three-jointed. With very few exceptions the prothorax is marginate or carinate at the sides in the genera of this subfamily.

Two groups, the Enopliini and the Corynetini, have been distinguished by Lacordaire, based upon differences in the form of the antennæ. Herr Reitter in adopting the same groups ('Bestimmungs-Tabelle der Cleriden') distinguishes them chiefly by the number of visible sternites in the abdomen, the Enopliini having six and the Corynetinæ only five sternites visible.

It is not clear from the arrangement in his recently published 'Catalogue of the European Coleoptera,' whether Herr Reitter regards the Corynetinæ as a family or as a subfamily; but it is quite evident that he considers the number of visible sternites in the abdomen to be a matter of primary importance, since he there includes in the Corynetinæ only such genera as were previously placed in his second group. If the additional sternite were at the base of the abdomen, there might be some slight justification for this view. But it is not. The sixth sternite, when visible, is at the apex, a condition which crops up in isolated genera or groups in various families of beetles. Even in the Cleridæ the character would be very difficult of application, for there are many genera of true Clerinæ in which there is so little of the sixth sternite visible that one would be justified in describing them as having only five visible sternites to the abdomen.

Although I consider the characters on which Lacordaire based his two groups to be unimportant, I cannot at present suggest any better arrangement. The introduction, however, of the Phyllobænini into this subfamily will necessitate some slight rearrangement of the genera. The genus *Pelonium*, Spin., requires to be split up, containing as it does at the present time species with finely faceted eyes and coarsely faceted eyes, with simple tarsal claws and with

appendiculate tarsal claws, differences accompanied by a marked difference in the general facies of the insects, and which to my mind are of more importance than the number of joints in the antennæ, whether 10 or 11, the character recently used by Herr Schenkling for dividing the genus into two sections.

It is a remarkable fact that, although this character—the number of joints in the antennæ—is largely used as a distinction between various other genera in the same group, I have more often than not found the number to be inaccurately stated. Thus Lacordaire, criticising the statements of his predecessors in reference to *Ichnea*, Cast., proceeds to say that in all the species of *Ichnea*, without exception, he had counted 11 joints in the antennæ. Gorham, in dealing with the Central-American species of the same genus ('*Biologia Centrali-Americana*,' Coleopt. iii. 2, p. 178), divided them into two sections with these characters:—*a.* Antennæ distinctly 11-jointed; *b.* Antennæ apparently 10-jointed. I have looked at the antennæ in all of these Central-American species with great care, both with a good lens and under the microscope, and in no species of the first section could I find more than ten joints, while in all the species of the second section there are evidently only ten joints, but the ten are all quite distinct, much more so than in the species of the first section. The sections are, nevertheless, natural ones, because the joints composing the funiculus of the antennæ are, in the first section, transverse, with the 5th and 7th joints small, whereas the joints of the funiculus are all subcylindrical in the species of the second section. I have further examined all other species of *Ichnea* accessible to me, including the genus type, and, except in two, could make out only ten joints in the antennæ: *I. batesiana*, Gorham, and *I. pelonioides*, Gorham (the second not more than a variety of the first), have eleven joints; but these two species must have been quite unknown to Lacordaire when he made the statement referred to above.

The Group Enopliini.—There is hardly any group of insects of the same limited extent in which the phenomenon of mimicry is better displayed than it is by the beetles of this small group. Within its limits are comprised the exact counterparts of various other Coleoptera, belonging chiefly to the families Lycidæ, Lampyridæ, Telephoridæ, Cistelidæ, Chrysomelinæ, Galerucinæ, and Coccinellidæ. But, however attractive this may be to the student of mimicry, it becomes somewhat of a nuisance to the systematist, since it tends to create a difficulty in classification by obscuring the natural

relationship existing between the different forms. The really good systematist, such as Lacordaire, could, of course, see beneath all these disguises; but that this has not been done in every case will, I think, be shown by the remarkable opinion expressed by that experienced entomologist Count Castelnau when writing upon Cleridæ of this particular group, led to it by a consideration of such resemblances as I have mentioned: "En tout il me semble probable que lorsqu'on abandonnera enfin le système tarsaire pour se rapprocher d'une classification naturelle, les insectes dont nous nous occupons ici seront partagés en groupes qui se placeront très loin les uns des autres." The tarsal system has been to a considerable extent abandoned, but the mimetic Cleridæ are still retained in the same old group, and are not to be found placed in the Heteromera, Malacodermata, Phytophaga, and other such groups, as Castelnau suggested they should be. Were he alive now he would doubtless be astonished to find many of them placed all in one single genus.

In his arrangement of the genera of this group Herr Schenkling places first *Allochotes*, Westw., and almost immediately after it the genus *Tenerus*, Casteln.; and in this I think he is, on morphological grounds, quite justified. But at first sight the two genera seem utterly remote from one another—the one composed of short, ovate, convex forms coloured exactly like Coccinellidæ and Chrysomelidæ; the other made up of elongate species suggestive in some cases of Telephoridæ and Lycidæ. In the first genus the antennæ are rather short and gradually clavate towards the apex, in the other longer and strongly serrate or subpectinate; but apart from the general difference in form, this is about the only well-marked difference in structure between the two. The gular area on the underside of the head is exceptionally short in the genus *Tenerus*, and becomes narrower behind, as in the genus *Clerus*; the same part is a good deal longer in *Allochotes*, but, as in *Tenerus*, the gular sutures converge behind.

Orthopleuroides, Kuw., and *Orthopleura*, Spin., are the only other described genera of the present subfamily in which I have noticed a similar form of gula. In other respects also these genera agree very well with *Tenerus*, though having a different form of antennæ and a slightly different structure of the tarsi. Instead of being placed, as at present, at the end of the Enopliini, they would come better, I think, soon after *Tene. us*.

TENEROIDES (Gorham, MS.), subgen. nov.

Under this name I have found in the Fry Collection a

species having characters like those of *Tenerus*, Cast., but differing in the fact that the third joint of the antennæ is dilated and resembles the fourth in form and size, and, further, that the hind femora in the male are strongly thickened and subfusiform. It appears to be undescribed.

Teneroides tavoyanus (Gorh. MS.), sp. n.

Rather elongate and narrow; fulvous-yellow or fulvous in colour, with the antennæ entirely black, the tibiæ, tarsi, and the apex of the femora piceous. Prothorax sparsely pubescent, subnitid, marked with a shallow, sinuately transverse impression near the apex, and having a small feeble tubercle before the middle of the base; elytra pubescent, each with three or four feeble costæ, the intervals between which are somewhat sulcate. In the female, the meso- and metathorax and the sides of the prothorax are very dark, nearly black. The antennæ are slightly longer in the male than in the female, and more strongly serrate.

Length, ♂ $5\frac{1}{3}$, ♀ 7 mm.; breadth $1\frac{1}{2}$ and 2 mm.

Hab. Tavoy in Tenasserim (*W. Doherty*).

The species described by me as *Tenerus sulcipennis* (P. Z. S. 1902, ii. p. 279) will have to go into this subgenus, but not knowing the male, I cannot say whether the hind femora are in this sex thickened or not.

In another very closely allied species, also belonging to this subgenus, and which I have determined from description to be *Tenerus subsimilis*, Schklg., the hind femora of the male are very strongly thickened.

One or two other species, apparently undescribed, which I found amongst the Lycidæ in the Fry Collection, labelled by Mr. Gorham *Calochromus* sp., belong also to the subgenus *Teneroides*.

TENEROMIMUS, gen. nov.

This genus is formed for two species which have completely the aspect of *Tenerus*, and agree with that genus in most of its characters; the head is similar in structure, and the gular area just as much reduced in size; the first joint of the tarsi is visible from above, and the tarsal claws are distinctly appendiculate at the base; the prothorax is somewhat parallel-sided, distinctly marginate on each side from the base up to the middle, and then less distinctly so in front; the pronotum is evenly and not strongly convex; the elytra are gradually but slightly widened behind, and are rounded at the apex, they are only slightly convex above. The antennæ are, however, 10-jointed, and quite different in form

from those of *Tenerus*; the last three joints are expanded and elongated, forming a flattened serrate club, which is more than three times as long as the rest of the antennæ, the intermediate joints, constituting the funiculus, are very short; some of them are difficult to distinguish in the first of the two species.

Teneromimus vitticollis, sp. n.

Pronotum, except along each side and a band along the middle, ochreous red; elytra entirely ochreous red; all the rest of the body, including the appendages, quite black. Upper surface, except on the black parts, covered with a rather dense reddish pubescence; head and prothorax minutely and very densely punctulate; elytra appearing to be impunctate, feebly convex, and along the disk, especially posteriorly, nearly flat, each with a few very faint costæ; ventral surface nitid, sparsely furnished with hairs.

Length 7 mm.; breadth 2 mm.

Hab. Melbourne in Australia. One example only in the British Museum.

Teneromimus humeralis, sp. n.

Head, prothorax, and elytra reddish testaceous, the latter moderately convex, long, widening posteriorly, blackish at the apex, each also with a distinct black, nitid spot extending back a little way from the shoulder; meso- and metathorax, abdomen, legs, and antennæ black. Upper surface not very densely pubescent; head very finely and densely punctulate, the prothorax still more minutely but somewhat less acutely punctulate.

Length $8\frac{1}{2}$ mm.; breadth at base of elytra 2 mm., at two-thirds of their length from the base 3 mm.

Hab. Alu Island, Solomon Archipelago (*C. M. Woodford*).

The single example of this species was sent among the unnamed *Teneri* to Herr Schenkling, and was returned labelled *Tenerus* n. sp. He must have overlooked the structure of the antennæ.

EPIPHLEUS, Spin.

This genus, rid of some of its species, would be a very well marked one, the sinuation or emargination of the eyes being very distinct and placed on the inner side at a good distance above the point of insertion of the antennæ. The antennæ are correctly described by Herr Schenkling as having 11 joints, but he has included in the genus a certain

number of species in which the antennæ are 10-jointed. Two of these, viz., *E. sericeus*, Klug, and *E. humeralis*, Spin., are rather different in facies from the more typical species of *Epiphleus*, and the emargination of the eyes is feebler and less removed from the antennæ. They approach somewhat closely a few of the species of *Ichnea*, and might either form with these a new genus or else be included in *Ichnea*.

Leconte and Horn, in referring to the latter genus, state that the pronotum is entirely continuous with the flanks of the prothorax, as in Clerinæ; but this can only be true of North American species which I have not seen. They say also that the eyes are emarginate on the inner side; this is the case with some species only, not the more typical ones, and the emargination is never much above the point where the antennæ are inserted.

Four other species of *Epiphleus* having only ten joints in the antennæ are of a somewhat narrow elongated form, and would be better placed in the genus *Phyllobænus*; these are *E. capitatus*, Gorham, *E. nitidus*, Gorham, *E. erythrocephalus*, Gorham, and *E. punctatus*, Gorham.

Epiphleus fasciatus, Klug (1842) = *E. chevoluti*, Gorham (1877).

Epiphleus velutinus, Gorham (1877) = *E. ruficeps*, Kuwert (1893).

Epiphleus schenklingi, sp. n.

Yellowish brown, with the head, prothorax, and a broad transverse band behind the middle of the elytra blackish brown; clypeus, labrum, and mouth-parts, excepting the mandibles (which are quite black), testaceous, the antennæ, legs, and body beneath of a similar colour, but somewhat darker. Head densely, minutely punctulate, sparsely covered with pale setæ; face rather broad and flat; eyes distinctly emarginate rather high up on the inner side. Prothorax very densely, finely punctulate, subtuberculately rounded at the middle of each side. Elytra rounded at the apex, strongly and very closely punctured from the base up to the front margin of the dark transverse band, and thence to the apex less thickly and less strongly punctate; the area between the black band and the apex is divided into a yellowish-brown anterior, and a somewhat blackish, apical zone, the latter being so covered with yellowish pubescence as partly to obscure the colour of the derm; the anterior zone is crossed by two bands of yellowish pubescence.

Length 9, breadth $2\frac{1}{2}$ mm.

Hab. Rio Janeiro (*A. Fry*). One example only in Brit. Museum.

Plocamocera, Spin.—This genus is closely allied to *Epiphlæus*, and differs chiefly by its much more slender antennæ, which are covered with long bristle-like hairs. The antennæ are described by Schenkling as having eleven joints, but I cannot distinguish more than ten.

Ellipotoma, Spin.—In the type *E. tenuicornis*, Spin., of this genus, I have after some trouble been able to make out ten joints in the antennæ, which at first appeared to me to have only nine. The genus seems to be nearly related to *Phyllobænus*, Spin., in which also the antennæ are ten-jointed. *Pyticeroides*, Kuw., a genus which I do not know, seems from the description to come near to, and possibly to be identical with, *Ellipotoma*.

I suggest later under *Apolopha* that two of the species placed by Gorham in that genus would be best placed in *Ellipotoma*, from which they differ little except in having only nine joints to the antennæ.

Phyllobænus, Spin.—This genus, if my suggestion be adopted, will now include the following species:—

- P. punctatus*, Gorh. (*Epiphlæus*).
- P. erythrocephalus*, Gorh. (*Epiphlæus*).
- P. capitatus*, Gorh. (*Epiphlæus*).
- P. nitidus*, Gorh. (*Epiphlæus*).
- P. dislocatus*, Say.
- P. merkei*, Horn.
- P. linearis*, Gorh. (*Apolopha*).

APOLOPHA, Spin. Mon. Clérides, i. p. 381 (1844).

Type, *A. reichei*, Spin. l. c. p. 383, pl. xxxvi. fig. 1.

This genus appears to me to have been quite wrongly identified by Gorham, who in this matter has been followed by Schenkling. Although I have seen no species that answers exactly to the description of *A. reichei*, I have not the least doubt that *Ichnea vitticollis*, Gorham, is congeneric, and indeed very closely related to it, possibly even only a variety. The fact that in Gorham's species the antennæ are 10-jointed, whereas Spinola described the antennæ in his species as having only eight joints, cannot be taken as an objection. In the figure of his species the antennæ are represented as having nine joints. Similarly in the case of *Pyticera* he has described the antennæ as 9-jointed, figured

them with ten joints, while in reality they have eleven. Spinola's statements as to the number of the antennal joints in species of this group are no more trustworthy than are some of those made by Mr Gorham himself. Mr. Gorham has placed in the genus *Apolopha* three Central American species—*trilineata*, Chev., *chiriquiana*, Gorh., and *linearis*, Gorh.; and his chief ground for doing so was, as he states, that the antennæ in these species have apparently only eight joints. There is, I admit, some difficulty in determining exactly the number of joints. In the first two of the species I make out nine joints, in the third ten joints in the antennæ. In all three the head in front is rather flat and without trace of a frontal costa, the presence of which is the chief characteristic of Spinola's genus. The first two species have very much the characters of *Ellipotoma*, and might very well go in that genus, while the third would be better placed in *Phyllobænus*.

The characters of *Apolopha*, as I interpret the genus, are as follows:—Head rather convex in front and having a frontal carina, anteclypeus membranous; labrum emarginate; last joint of labial and maxillary palpi flat, elongate, subtriangular; eyes rather finely faceted, deeply emarginate, with the antennæ placed under a short carina opposite the emargination; antennæ 10-jointed, the 5th and 7th joints not transversely produced. Acetabula of front coxæ closed behind by the prolongation inwards of the epimera to meet the prosternum. First joint of hind tarsi moderately long, rather narrow, the second and third joints with membranous lobe beneath.

To this genus the following species belong:—

- A. reichei*, Spin.
- A. vitticollis*, Gorh. (*Ichnea*).
- A. nitida*, Gorh. (*Ichnea*).
- A. suturalis*, Klug (*Enoplium*).
- A. fryana*, Gorh. (*Ichnea*).
- A. fronticosta*, Kuw. (*Ichnea*).

Pelonium, Spin.—This genus, as at present constituted, is not a homogeneous one, and may very well be divided up into at least three different genera, for one of which the name *Lasiodera*, proposed by Gray, may be adopted.

(1) *LASIODERA* (Gray), gen. nov.

Eyes finely faceted, deeply emarginate in front, widely separated from one another both above and below; acetabula

of front coxæ not closed in behind; femora rather stout, especially those of the front legs in the male; first tarsal joint visible from above, claws simple.

Type of the genus, *L. kirbyi*, Gray.

This genus will include also the following species now placed in *Pelonium*, and probably some others at present unknown to me:—

L. trifasciata, Cast.

L. rufipes, Klug.

L. ruficollis, Gorham.

(2) PELONIUM.

If, as Gorham suggested, *P. pilosum*, Forst., be taken as the type, this genus can scarcely be separated from *Chariessa*, Newm. If, on the other hand, *P. lampyroides*, Spin., the first species mentioned and described by Spinola, be regarded as the type, as I think it should be, then *Pelonium* remains a distinct genus with characters as follows:—

Eyes large, coarsely faceted, emarginate in front, not widely separated above; acetabula of front coxæ open or sometimes closed behind, tarsal claws simple.

Here may be placed *P. lampyroides*, Spin., *optabile*, Gorh., *luridum*, Gorh., *lituratum*, Kirby, *placidum*, Schklg., and all other species now placed in the genus in which at the same time the eyes are coarsely faceted and the tarsal claws simple. These species are mostly those of larger size and more elongated form.

(3) GALERUCLERUS, gen. nov.

This genus is proposed to include all those species of *Pelonium* in which the eyes are coarsely faceted and the tarsal claws distinctly appendiculate at the base. These species are nearly all smaller than those of the genus *Pelonium* proper, with the elytra shorter in proportion and more widened and obtusely rounded behind. They have a great resemblance to Galerucidæ, and not a few of them are exact mimics of species of *Diabrotica*.

Pelonium sexnotatum, Klug, may be taken as the type of the genus. In this species, as in the majority, the antennæ are 10-jointed, in others they are 11-jointed.

The Group Corynetini.—I have no changes to suggest in the order of the genera of this group as they appear in Herr Schenkling's work. *Laricobius*, as is now generally

admitted, belongs to the family Derodontidæ, and must be removed from the group. On the other hand, the following genera, as I have earlier shown in this paper, must be admitted into the group, viz., *Tarsosenus*, Spin., *Tarsostenodes*, Blekb., and *Thanasimorpha*, Blekb.

NECROBIOIDES, gen. nov.

Head short; anteclypeus membranous, labrum short, broad, arcuately emarginate in front; eyes finely faceted, emarginate in front; gula very narrow behind. Antennæ inserted under a carina opposite the emargination of the eye, eleven-jointed, the last three joints forming a somewhat compact club, 8th joint very short, but nearly as broad as the base of the 9th; 3rd to 7th joints short, subequal in length. Prothorax distinctly marginate at each side, marked above with a faint sinuately transverse depression at about one-fourth of its length from the apex. Elytra as in *Necrobia*, but having each a slight swelling on the disc near the base. Acetabula of front coxæ open behind. First joint of tarsi placed below the base of the second; fourth joint very small; claws bifid, the inner tooth shorter than the outer.

This genus is formed for a Mexican species, which in colour and form as well as in many points of structure very closely resembles the genus *Necrobia*. It differs, however, in the structure of its claws, the anterior depression on the pronotum, and its very much smaller gular area.

Necrobioides mexicana, sp. n.

In colour and shape quite like some of the larger blue specimens of *Necrobia rufipes*, but with the legs and antennæ entirely black. Head thickly but not strongly punctured in front. Prothorax sparsely and feebly punctate. Elytra distinctly and very thickly punctured.

Length 6, breadth $2\frac{1}{2}$ mm.

Hab. Mexico: Hacienda de la Imagen in Guerrero, 4000 ft. (*H. H. Smith*).

One specimen only in the British Museum. This specimen was sent amongst the *Necrobiæ* to Herr Schenkling, and was returned by him labelled *Necrobia* n. sp.; but although so very like a *Necrobia*, I consider that the difference in the structure of the claws, the size and shape of the gula, the presence of a depression anteriorly on the pronotum, and of a hump at the base of the elytra, justify me in regarding it as the type of a new genus.

VIII.—*Descriptions of new Species of Monkeys of the Genera Galago, Cebus, Alouatta, and Cercopithecus.*
By D. G. ELLIOT, D.Sc., F.R.S.E., &c.

Family Nycticebidæ.

Subfamily GALAGINÆ.

Genus GALAGO.

Galago pupulus, sp. n.

Type locality. Yola, Nigeria.

Gen. char. Size small; colour pale; ears very large; rostrum long, molar series large, tail long.

Colour. Top of head, hind-neck, and back to root of tail brownish grey, the brown tinge less noticeable between shoulders, which part is a more decided grey, between eyes whitish; sides of head, chin, throat, underside of body and inner side of thighs greyish white; forearms and legs cream-buff; inner side of arms buffy white; hands and feet cream-buff; tail drab grey; ear reddish brown.

Measurements. Total length 369 mm.; tail 220; foot 37. Skull: total length 40·2; intertemporal width 28·6; breadth of brain-case 22·4; hensel 26·2; zygomatic width 25; length of nasals 12·8; palatal length 12·5; length of upper molar series 13; length of mandible 22; length of lower molar series 11·5.

Type. Adult male in British Museum, no. 9.9.3.1.

In general appearance this species is very like *G. mozambicus*, living some thousands of miles distant, but the skull-characters are very different. The species just named is remarkable for its very short rostrum, while the present animal has a long rostrum with slender nasals of about equal width for their entire length, while those of its relative broaden considerably at the tip; the bullæ also are much larger and narrower, and the teeth of the molar series much larger.

Family Cebidæ.

Genus CEBUS.

Cebus versuta, sp. n.

Type locality. Rio Jordao, western part of Minas Geraes, Brazil.

Gen. char. Hair on head very thick, long, depressed in

the centre and rising on each side on broad ridges extending from forehead to occiput, unlike horns or tufts; size large, tail long, thick; hairs of body long, loose; arms above elbows pale colour; fingers and toes grey.

Colour (male). Top of head from forehead to nape, extending to hind-neck, black; temples and cheeks yellowish white; dark brown band in front of ear down side to lower jaw, but not meeting beneath chin; dorsal region Prout's brown, rest of upper parts and flanks bistre; arms above elbows and sides of neck cream-buff; thighs ochraceous buff; forearms and legs below knees black speckled with reddish, most marked on forearms; throat, chest, under parts to scrotum, inner side of arms above elbows and innermost side of thighs golden yellow, inner side of forearms, outer portion of thighs, and legs below knees, scrotum, and anal region black; hands and feet black, fingers and toes covered with grey hairs; tail above three-fourths black speckled with red, remainder black, beneath brownish black, hairs pale yellow at base then brownish black, or towards tip greyish white at base then black.

Measurements. Total length 910 mm.; tail 460; foot 132; ear 35 (collector). Skull: total length 94.1; occipito-nasal length 81.7; intertemporal width 70.3; palatal length 32.1; length of nasals 28.1; length of upper molar series 23.5; length of mandible 64.5; length of lower molar series 28.3.

Type. Adult male in the British Museum, no. 1.11.3.4.

This species belongs to the *Azaræ* group as indicated by the grey fingers and toes. It is, however, a much darker animal than either *C. azaræ* or *C. a. pallidus*. The patch on the head is more extensive, heavier, and blacker than that of *C. azaræ*, and of course entirely different from that of *C. a. pallidus*, with its two imperfect black patches. The black cap of *C. azaræ* has low ridges on either side, in some specimens these form upright tufts over forehead, quite different from the conspicuous ridges of the present species, which rise close together at the forehead, widen out as they extend backward, until, with the exception of a narrow division in the centre, they occupy the entire occipital portion of the head. The colouring of the two forms, as the descriptions show, is quite unlike. Five specimens were procured by M. Robert on the Rio Jordao, in Araguay, Western Minas Geraes, Brazil, all of which are in the British Museum.

Cebus caliginosus, sp. n.

Type locality. Sta. Catharina, São Paulo, Brazil.

Gen. char. Size large; head tufted, tooth-rows straight, teeth large.

Colour. Face flesh-colour about eyes and forehead; lips apparently brownish; superciliary band extending backwards to temples yellowish white; hairs on upper lip at corners of mouth and on chin whitish; head with tufts, band in front of ears, body above and beneath, limbs and tail jet-black; hands and feet brownish black; hairs on fingers and toes brownish grey.

Measurements. Total length 1095 mm.; tail 560; foot 135; Skull: total length 99·3; occipito-nasal length 89·2; inter-temporal width 40; width of brain-case 53·5; hensel 70·4; zygomatic width 73·2; length of nasals 18·2; palatal length 33·5; length of upper molar series 24·8; length of mandible 70; length of lower molar series 28·5.

Type. Adult, in British Museum, no. 3. 9. 1. 15.

This is a very large *Cebus*, and was received from the Museum in São Paulo, Brazil, under the name of *C. robustus*. The skull is large, with the molar series straight, and the teeth larger than those of *C. fatuellus*. This example came under my notice last spring, and I was then satisfied it must represent a new species, but did not include it in my paper with other undescribed species, preferring to wait and see if perhaps I could find another example in the continental museums. In this search I failed, no specimen resembling this one in any way having been seen. It is the only black *Cebus* I have met with, and its large size, prominent tufts, and coal-black dress make it a very conspicuous object. It is, of course, needless to add that it bears no resemblance whatever to *C. robustus*.

Subfamily ALOUATTINÆ.

Genus ALOUATTA.

Alouatta insulanus, sp. n.

Type locality. Island of Trinidad.

Gen. char. Size small; colour nearly uniform throughout; limbs only slightly darker than the body.

Colour. Head and whiskers maroon, darkest on chin and throat; upper part of body and flanks red, in certain lights with a golden hue; limbs, hands, and feet bright red, with a maroon tinge on forearms; tail at root bright maroon, grading into golden and growing paler at tip.

Measurements. Total length 1120 mm.; tail 600; foot 105. No skull.

Type in British Museum, no. 93. 7. 5. 1.

This red Howler in general appearance resembles somewhat the Rio Juara species on the Rio Juara; but is considerably smaller, has less of the golden hue on the body, and paler limbs and tail.

Alouatta macconnelli, sp. n.

Type locality. Coast of Demerara.

Geogr. distr. English and French Guiana, Cayenne to coast north of the Amazon.

Gen. char. Upper parts unicolor; under parts orange-red.

Colour. Head rich maroon-red; entire upper parts and flanks golden yellow, tips of hairs in certain lights fiery golden; base of hairs black; arms to elbows and thighs and under parts deep orange-red; forearms, hands, legs below knees, feet maroon-red; tail maroon-red at base, growing paler towards tip.

Measurements. Total length 1390 mm.; tail 670. Skull: occipital region wanting; intertemporal width 44.5; palatal length 46.8; zygomatic width about 86.8; length of nasals 21.3; length of upper molar series 38.1; length of mandible 107.7; length of lower molar series 42.2.

Type (adult) in British Museum, no. 8. 3. 7. 3.

This form differs from *A. seniculus* in not having the dark hues on the upper part of the back, limbs, hands, feet, and tail. The upper parts and flanks in the adults are a rich golden hue from the nape to the tail, and the under parts and limbs a beautiful orange-red, quite different from the typical style on the north-western part of the continent.

Alouatta juara, sp. n.

Type locality. Rio Juara, Peruvian Amazon.

Gen. char. General colour golden-red; arms and legs darker.

Colour. Head and whiskers bright maroon, darkest under the chin; upper parts of body and flanks golden-red; arms and legs, hands and feet maroon, darker than body; under parts and inner side of body red; tail maroon at base, grading into golden-red, similar to body.

Measurements. Total length 1145 mm.; tail 625; feet 130. Skull: total length 126.3; occipito-nasal length 104.9; intertemporal width 40.2; breadth of brain-case 54.5; hensel 106.2; zygomatic width 81.4; length of nasals 25.9; palatal

length 44·3 ; length of upper molar series 35·8 ; length of mandible 94·8 ; length of lower molar series 42·9.

Type (adult) in British Museum, no. 3. 9. 1. 1.

The peculiarity of this species is its general red colour, the bright maroon of the head grading into the golden-red of the body, without any marked line separating the hues. Its general aspect is that of a red monkey, with limbs darker than body. The basal portion of the tail is nearer the colour of the thighs, the remaining part much lighter.

Two specimens are in the British Museum collection, both from the Rio Juara.

Alouatta sara, sp. n.

Type locality. Province of Sara, Bolivia.

Gen. char. Colour of body uniform, limbs only slightly darker, under parts yellowish, not orange-red as in the Guiana species. Black band around face to beneath chin.

Colour. Head very dark maroon ; band across forehead, down sides of head in front of ears, meeting beneath chin, black ; upper parts of body and flanks, arms to elbows pale golden-orange, darkest on dorsal line, base of hairs black ; forearms, legs, hands, feet, and tail above orange-red ; chin red, paler than sides of head ; hairs on under parts nearly gone, but are apparently yellowish with a red tinge ; hairs of flanks along abdomen yellowish red, quite unlike the orange-red of Guiana examples ; underside of thighs yellowish red, and tail beneath pale red.

Measurements. Total length 1120 mm. ; tail 590 ; foot 130 ; ear 40 (collector). Skull : total length 110·4 ; occipito-nasal length 92 ; intertemporal width 43 ; hensel 19·6 ; zygomatic width 68·2 ; length of nasals 17·4 ; palatal length 35·5 ; length of upper molar series 32 ; length of mandible 81·2 ; length of lower molar series 38·2.

Type in British Museum, no. 7. 8. 2. 1.

This example from Bolivia is a female. It differs from others of the red Howlers, as typified by *A. seniculus*, in the black band around the face, the uniform golden-orange colour of the upper parts, and the yellowish or orange-red of the hairs on the sides of the abdomen.

Family Cercopithecidæ.

Genus CERCOPITHECUS.

Cercopithecus inobservatus, sp. n.

Type locality. West Africa (exact locality unknown).

Gen. char. Allied to *C. cephus*, but upper parts ochraceous, not red, and a conspicuous rufous band on brow behind the black superciliary line, as in *C. brazzæ*.

Colour (adult male). Superciliary band black, extending backward on sides of head from eyes to ears, and down sides of face to upper lip; cheeks also black; a rufous band across forehead behind the superciliary line; top and back of head mixed yellow and black, the yellow most prominent on fore part of head; entire rest of upper parts, shoulders, and thighs ochraceous and black, much paler than the same parts in *C. cephus*, the hairs being pale grey at base, then banded with black and ochraceous, and tipped with black; broad patch over temples to ears yellowish; hairs on lips and chin black; throat greyish white; entire under parts, inner side of arms to elbows, and legs to ankles dark smoke-grey, much darker than *C. cephus*; forearms and hands and feet blackish, sparsely speckled with pale yellow; legs below knees speckled black and yellow; tail above, basal portion like back, then blackish maroon, grading into pale bright red; beneath dark grey at base, grading into pale red.

Measurements. Total length 1330 mm.; tail 750; foot 145. Skull: total length 119·6; occipito-nasal length 90·7; inter-temporal width 40·9; breadth of brain-case 56·8; hensel 79; zygomatic width 73·2; palatal length 41·5; length of upper canine 20; length of upper molar series 25·5; length of mandible 78·3; length of lower molar series 32·2.

Type in British Museum, no. 47. 3. 1. 6.

The skull when compared with that of *C. cephus* has a much greater length, a longer and more protruding rostrum, and a longer brain-case, broader posteriorly. The orbits are differently shaped, more circular than oblong, with a greater extreme width. The teeth are much larger and the upper molar series longer by nearly the width of the first premolar; the palate is longer and wider and the basioccipital much shorter and narrower. The difference in the size of this bone in the two skulls compared is remarkable.

This is a rather extraordinary specimen. It has been in the British Museum for a long time, was obtained by Mr. Bartlett, and is stated to have come from West Africa, but no particular locality given. Beside the great difference in the colour of the pelage between this example and specimens of *C. cephus*, the rufous-brown band at once separates it from that species and seems to point to a relationship with *C. neglectus* and *C. brazzæ*. It is not so broad as the brow-bands of those species, and it is the only character these animals have in common so far as their coloration is concerned. If

there is any relationship between this species and the others it would naturally be with *C. brazzæ* from the Congo rather than with *C. neglectus* from the White Nile.

I take this opportunity to call attention to an error in my paper describing numerous monkeys, lately published in this Journal (Sept. 1909, p. 261), arising from copying from the original MS., where *Cercopithecus grayi pallidus* is printed *Cercopithecus pogonius pallidus*. The name should be changed to *C. grayi pallidus*. The context in the article clearly shows that the race is more closely allied to *C. grayi* than to *C. pogonius*, as all the comparisons are made with the former species and not with the latter.

IX.—*New African Mammals.* By OLDFIELD THOMAS.

(Published by permission of the Trustees of the British Museum.)

Petrodromus tordayi, sp. n.

A very dark-coloured species of the *P. tetradactylus* group.

Size about as in *P. venustus*. Fur very soft, more woolly than in other species; hairs of back about 13 mm. in length. General colour above conspicuously darker than in any of the allied species, near broccoli-brown when looked at from behind, Prout's brown or almost seal-brown when seen from above or in front. The usual line of grey on each side of the median dorsal area almost suppressed. Flanks ochraceous buff, dulling to clay-colour anteriorly on the cheeks. Under surface cream-buff, the bases of the hairs slaty. Face like back; a well-defined median black line along the top of the muzzle. Face-markings all much darker than usual. Light eye-rings very narrow, a dull buffy patch above the posterior half of the eye. Usual dark line from back of eye below ear darkened nearly to black and continued as a marbled slaty-black patch behind the level of the ear; above, at the base of the ear, there is a blackish ring on each side separating the colour of the crown from the usual light basal ring so conspicuous in other species; this, however, is only buffy, not white, and is therefore much less conspicuous than usual. Hands and feet dull buffy, the inner side of the forearms, and all round the thighs, naked. Tail very thinly haired, practically naked, the black skin quite unhidden by the hairs.

Hind foot 52 mm.; other dimensions not available.

Hab. Misumba, Sankuru River, South Central Congo.

Type. Adult skin without skull. B.M. no. 9. 12. 12. 5. Collected and presented by E. Torday, Esq.

This is the first *Petrodromus* found within the Congo basin, and its remarkably dark colour is no doubt the result of the saturate conditions there prevailing. I have named it in honour of its discoverer, to whom the Museum owes a number of interesting mammals from this little-known region.

Chrysochloris congicus, sp. n.

Closely allied to *C. leucorhina*, Huet, from the coast of French Congo, but markedly smaller (see skull-dimensions) and of a different colour. Fur of medium length; hairs of back about 7 mm. in length. General colour dark "slate" or "mouse-grey" (Ridgway) instead of "brun chocolat foncé" (Huet); under surface slightly paler. Face creamy white, as in *leucorhina*.

Dimensions of the type (measured on the spirit-specimen):—

Head and body 63 mm.; hind foot, s. u. 9, c. u. 11; breadth of nasal pad 7.

Skull: greatest length 19, greatest breadth 13.5; length of upper tooth-row 7.4.

Hab. Lusambo, Upper Sankuru R., South Central Congo.

Type. Subadult in spirit. B.M. no. 9. 12. 10. 2. Presented by the Liverpool School of Tropical Medicine. Collected during Drs. Dutton and Todd's expedition. Two skins without skulls collected at Misumba in the same district have also been presented by Mr. E. Torday.

This species is readily distinguishable from *C. leucorhina* by its smaller size and different colour. In tooth-formula and the conspicuous white face it quite agrees with that animal.

Chrysochloris vermiculus, sp. n.

A species of about the size of *C. leucorhina*, but of a uniform pale brown colour, approximately "fawn" of Ridgway, a colour quite unlike that found in any other member of the family. Under surface slightly lighter. Face quite uniform with the body, not contrasted white as in *leucorhina*. Fur of back 8 mm. in length.

Skull and teeth unknown.

Head and body, measured in skin, (c.) 105 mm.; hind foot, s. u. 9.5, c. u. 12.

Hab. Yambuya, Aruwimi R., Congo.

Type. Adult skin. B.M. no. 0. 3. 2. 1. Collected during the Emin Relief Expedition and presented by J. S. Jameson, Esq.

This very peculiarly coloured species cannot be confused with any hitherto described.

Protoxerus stangeri signatus, subsp. n.

Agreeing with *P. s. eborivorus*, Du Chaillu, in all essential respects, but the grizzled blackish line at the lower edge of the upper colour on the flanks quite without the fine white tickings, and consequently deep uniform black, well contrasted with the grizzled brownish above it, and the fine whitish line which separates it from the belly. Posterior back of the somewhat warmer tone found in *P. s. centricola*. Feet rich rufous. Hands also tending towards rufous, which is unusual in this group.

Hab. Central and Southern Congo. Type from Lodja, Upper Lukenye R., Southern Congo. A second specimen from Ikau, Central Congo.

Type. Adult male. B.M. no. 9. 12. 12. 7. Collected and presented by Mr. E. Torday.

A special Genus for *Mus univittatus*, Peters.

The position of the peculiar W. African rat described by Peters under the above name has long been doubtful, and it has sometimes been placed in *Mus* and sometimes in *Arvicanthis*. It differs, however, from both so much that I think it should form a special genus, which may be called HYBOMYS.

Externally it resembles *Arvicanthis* in its black dorsal line and shortened fifth hind toe (not so much shortened, however), but differs by its much more slender build and its almost naked tail. $Mammæ\ 0-2=4$.

Its skull is peculiarly bowed, of quite different shape to that of either *Arvicanthis* or *Mus*. Its molars are, on the whole, like those of the former.

Good accounts of it have been given by Peters (MB. Ak. Berl. 1876, p. 479) and Tullberg (MT. Ges. Upsala, 1893, p. 20, with figures of the skull and teeth), so that further description is not now necessary.

Arvicanthis wroughtoni, sp. n.

Allied to the common E. African *A. massaicus*, but the dark ground-colour of the back black instead of brown, so

that instead of it being a brown animal with one median black and a number of lateral light lines of spots, it is simply a black animal with lines of light spots. The median line is absolutely deep black without any fine light tickings; then three stripes on each side are black with a few minute light tickings in them; then from the fourth to the edge of the belly there is enough admixture of light in the dark bands to make them brown rather than black. Lines of light spots cream-coloured, rather narrower than in *massaicus*. Under surface white, not sharply defined laterally. Head blackish, finely lined with cream. Ears dark brown, the ochraceous spot at their anterior base far less conspicuous than in *massaicus*. Arms and hands dull buffy. Rump and hind legs with scarcely any rufous suffusion. Feet dull ochraceous. Tail brown above, dull buffy on sides and below.

Skull intermediate in size between those of *A. massaicus* and *macculus*, the greatest lengths being 31, 29, and 28 mm. respectively. Palatal foramina more narrowed posteriorly than in the allied species.

Dimensions of the type:—

Head and body 110 mm.; tail 119; hind foot 25.

Skull: greatest length 29; basilar length 23; greatest breadth 13·7; palatal length 15; palatal foramina 5·7; upper molar series 5·1.

Hab. Nono, W. of Addis Abbaba, S. Abyssinia. Alt. 3600 m.

Type. Adult male. B.M. no. 6. 11. 1. 30. Original number 77. Collected 30th April, 1905, by Ph. C. Zaphiro, and presented by Mr. W. N. McMillan.

I have named this handsome and distinct species in honour of Mr. R. C. Wroughton, to whom so much of our knowledge of the genus *Arvicanthis* is due.

Leggada minutoides umbrata, subsp. n.

Essential characters of true Cape *minutoides*, but the back much darkened by an intermixture of blackish hairs, the resulting colour of the whole dorsal area, from crown to rump, dark greyish, between "sepia" and "hair-brown." Sides dull buffy. Belly, as usual, pure sharply-defined white.

Dimensions of the type (measured in flesh):—

Head and body 71 mm.; tail 50; hind foot 14; ear 10.

Skull: greatest length 19·5.

Hab. Wakkerstroom, S.E. Transvaal. Alt. 5900'. One specimen from Zuurbron, 4900'.

Type. Adult female. B.M. no. 4. 9. 1. 57. Original number 715. Collected 22nd March, 1904, by C. H. B. Grant. Presented by C. D. Rudd, Esq. Five specimens examined.

In fully adult specimens of true Cape *minutoides* the back is sandy or fawn, only immature examples being greyish. The Wakkerstroom series are all adult, and one of them quite old.

Leggada bella, sp. n.

Allied to the true S. African *L. minutoides*, but smaller.

Size small, barely larger than the little *L. tenella* of the Soudan. Fur crisp; hairs of back about 5-5.5 mm. in length. General colour above rather warmer and more buffy than in *L. grata*; sides buffy, the buffy encroaching on the dorsal area more than in *L. grata*, less than in *tenella*. Belly pure sharply-defined white, the hairs along the lower edge of the buffy becoming abruptly white to their roots. Crown like back; face and cheeks scarcely lighter. Ears generally without white spot at their posterior bases. Hands and feet white. Tail brown above, whitish below.

Skull small, its structure about as in *L. grata*. Distinguishable from that of *L. minutoides* by its smaller size and from that of *L. tenella* by its normal, not elongated palate; the palation about half a millimetre behind the back of m^3 . Masseteric knob on zygomatic plate nearer its front than its hinder edge.

Dimensions of the type (measured in skin):—

Head and body (c.) 60 mm.; tail 44; hind foot 12.

Skull: greatest length 17.4; condylo-basal length 16.2; breadth across brain-case 9; nasals 6.3; interorbital width 3.3; palatal length 8.7; diastema 4.5; upper molar series 3.2.

Hab. (of type). Machakos, British E. Africa. Alt. 5000'.

Type. Adult female. B.M. no. 1. 8. 7. 11. Original number 75. Collected 21st March, 1901, and presented by S. L. Hinde, Esq.

L. bella seems to be the common white-bellied form throughout Central Africa from Abyssinia and the Upper Nile southwards to the Transvaal and Zululand, specimens from many localities in this large area agreeing in their size and more important characters. But besides the typical E. African form, I propose to recognize the following local subspecies. Peters's name *minus* would have been applicable to this species had it not been pre-occupied.

The S. African *L. minutoides* is distinctly larger.

Leggada bella gallarum, subsp. n.

Like *L. bella* in all respects, but distinctly smaller. Fur close and crisp; hairs of back about 3·6–3·8 mm. in length. Colour essentially as in *bella*, but rather less rich, the back less darkened and the sides not so bright.

Skull, apart from its smaller size, quite as in *L. bella*.

Dimensions of the type (measured in flesh) :—

Head and body 54 mm.; tail 38; hind foot 11; ear 10.

Skull: greatest length 16·7; breadth of brain-case 8·1; upper tooth-row 2·9.

Hab. Harar, E. Abyssinia. Alt. 6000'.

Type. Adult male. B.M. no. 1. 7. 6. 17. Original number 2. Collected 22nd November, 1900, and presented by A. E. Pease, Esq.

Leggada bella vicina, subsp. n.

Essential characters of *L. bella*, but the fur shorter and rather crisper (hairs of back less than 4 mm. in length), the light colour of its sides more extended, and the cheeks and area round the eyes light buffy, the dark colour of the crown ending in a point opposite the anterior canthus of the eye. A slight indication of a subaural white spot.

Skull as in *L. bella*.

Dimensions of the type (measured in flesh) :—

Head and body 57 mm.; tail 45; hind foot 12; ear 10.

Upper molar series 3·0.

Hab. Takaungu, near Mombasa. Alt. 70'.

Type. Subadult female. B.M. no. 1. 5. 1. 32. Original number 10. Collected 10th December, 1900, and presented by A. B. Percival, Esq.

Obviously a hot-climate coast representative of *L. bella*.

Leggada bella marica, subsp. n.

Differing from true E. African *bella* somewhat as *umbrata* does from *minutoides*, the buffy or tawny tones altered along the upper surface, and especially on the crown, by an increased amount of black hairs, so that the colour is lined brown above, while the sides are a much less bright and conspicuous buffy.

Dimensions of the type (measured in flesh) :—

Head and body 57 mm.; tail 43; hind foot 12; ear 9·7.

Skull: greatest length 18.

Hab. (of type). Beira, Portuguese E. Africa. Alt. 45'. Other specimens from Nyasaland, Inhambane, and Zululand.

Type. Adult male. B.M. no. 7. 6. 2. 93. Original number 1757. Collected 28th December, 1906, by C. H. B. Grant. Presented by C. D. Rudd, Esq.

Leggada bella induta, subsp. n.

Size about as in *L. bella*. Fur long, soft, and rich, the ordinary hairs of the back about 6 mm., and the unusually numerous fine ones projecting beyond it about 10–11 mm. in length. General colour dull buffy or clay-colour, being buffy ochraceous on the sides, edging the sharply-defined pure white belly. Centre of crown scarcely darker than the area round the eyes. Outer surface of arms and legs like sides. Tail with its upper surface pale brown, sides and below whitish.

Skull very much as in true *bella*; the teeth slightly broader; the palate produced a little behind the front end of the parapterygoid fossæ.

Hab. Molopo, W. of Morokwen, Northern Bechuanaland.

Type. Adult male. B.M. no. 4. 10. 1. 85. Original number 91. Collected 15th July, 1904, by R. B. Woosnam.

Found side by side with *Leggada deserti*.

Leggada pashu, sp. n.

A very large species of the white-bellied group.

Size about equal to that of *L. triton*, the largest species of the grey-bellied group. General colour above uniform cinnamon, rather more ochraceous on sides, but not conspicuously so; dorsal area not specially darkened. Under-side wholly white to the bases of the hairs. Head like body; no lighter rings round eyes. Ears without basal white spot. Hands and feet white.

Skull about the size of that of *L. triton*; palate not elongated.

Dimensions of the type (measured in skin):—

Head and body 87; tail (?) ; hind foot 15.

Skull: tip of nasals to back of interparietal 20; upper molar series 4.

Hab. Tingasi, Monbuttu.

Type. Adult male. B.M. no. 87. 12. 1. 93. Collected 6th July, 1883; presented by Emin Pasha.

This fine species is readily distinguished from every other white-bellied *Leggada* by its large size, all the larger *Leggadas* hitherto known belonging to the grey-bellied group.

Leggada neavei, sp. n.

A richly-coloured tawny species of the *minutoides* group.

Size about as in true Cape *minutoides*. Fur crisp; hairs of back about 4.3–4.5 mm. Colour of back mixed black and tawny, the tawny becoming dominant on the sides, where it contrasts sharply and abruptly with the pure white under surface. Dark of back contracting on crown and between eyes, the latter surrounded by a tawny area. Region below and behind ears lighter tawny.

Skull about as long as in *minutoides*, but more delicately built, with smaller brain-case. Incisors more thrown forward than in other species, their front surface terminally vertical, not turned in towards the throat. Posterior nares narrowed, opening nearly a millimetre further back than the front ends of the parapterygoid fossæ. Masseteric knob on zygomatic plate unusually small, close to the anterior edge of the plate.

Dimensions of the type (measured in the flesh):—

Head and body 58 mm.; tail 39; hind foot 13.

Skull: greatest length 19.2; basilar length 15.6; greatest breadth 10; nasals 7.2; interorbital breadth 3.2; palatilar length 9.8; upper molar series 3.3.

Hab. Petauke, E. Loangwe District, N.E. Rhodesia. Alt. 2400'.

Type. Adult male. B.M. no. 7. 1. 11. 65. Original number 55. Collected 28th December, 1904, by Mr. S. A. Neave.

This species differs from all others by its rich tawny colour and more forwardly directed incisors.

Leggada deserti, sp. n.

A pale-coloured desert species, with white tail and narrowed posterior nares.

Size about as in *L. bella*. Fur long (hairs of back 7 mm.), soft and fine, not at all spinous. General colour above "pinkish buffy," darkened on the back, clear along the sides edging the abruptly pure white underside. Sides of face buffy, the dark area on the crown little marked. Lateral line of demarcation high, above the whole of the limbs, so that these from shoulders and hips downwards are completely snowy white; in other species the forearms and legs are more or less of the colour of the body. Tail wholly white, above and below.

Skull about as in *L. bella*, except that the posterior nares are almost covered over by the close approximation of the bases of the pterygoids, the breadth of the opening proximally

being about one-sixth of a millimetre, and the opening itself rather farther back than usual, though not so far as in *L. tenella*. In the usual correlation with this character the zygomatic plate is shorter than usual, and its masseteric knob is slightly nearer its posterior than its anterior edge.

Dimensions of the type (measured in the flesh):—

Head and body 51 mm.; tail 44; hind foot 12·5; ear 12.

Skull: greatest length 17·5; basilar length 13·5; greatest breadth 9·2; nasals 6·8; upper molar series 2·9.

Hab. Molopo, W. of Morokwen, Northern Bechuanaland.

Type. Adult male. B.M. no. 4. 10. 1. 86. Original number 94. Collected 15th July, 1904, by R. B. Woosnam.

This beautiful little desert species is widely different from any other *Leggada*. Curiously enough, the other specimen obtained with it*, and superficially very like it, proves to be a local subspecies of the ordinary Central African species *L. bella* (see above).

Leggada triton murilla, subsp. n.

Colour very much as in true *Mus musculus*, therefore paler and greyer than in the mountain forms *L. triton* of Elgon and *fors* of Ruwenzori. Upper surface nearest to sepia of Ridgway, rather paler on sides and becoming faintly buffy along the edge of the belly colour. Under surface greyish white, the hairs slaty for two-thirds of their length; line of demarcation on sides not sharply marked. Hands and feet dull white.

Dimensions of the type:—

Head and body (c.) 70 mm.; tail 50; hind foot 16.

Skull: greatest length 22·5; upper molar series 3·7.

Hab. (of type). Machakos, British E. Africa. Alt. 5400'.

Type. Adult male. B.M. no. 1. 12. 9. 13. Original number 92. Collected 14th June, 1901, and presented by Dr. S. L. Hinde.

On comparing all the grey-bellied *Leggadas* of this group it would appear that *triton* and *fors* are mountain forms from Elgon and Ruwenzori respectively of a widely-spread species very like *Mus musculus* in general appearance. The mountain forms are much darker and more "saturate" than *murilla*, whose range extends from East Africa and Uganda southward into North-eastern Rhodesia. Owing to the accidental delay in the publication of the Ruwenzori report, the name *triton* takes precedence of *fors* for the primary name of the species.

* Cf. *Leggada minutoides*, Schwann, P. Z. S. 1906, i. p. 110.

Cephalophus simpsoni, sp. n.

Closely similar in colour to *C. nyasæ*, but considerably smaller, and with the ordinary small short skull of the Bluebucks generally, instead of the unusually elongated skull of *C. nyasæ*. Median dorsal area dark vandyke-brown, over a breadth of about three inches, passing laterally through "burnt umber" into deep russet on the flanks and limbs. Belly paler russet, its median area whitish, the hairs everywhere grey basally. Interramia whitish; throat dull russet. Crown and top of muzzle dark brown, the supraorbital line and cheeks reddish. Limbs, both fore and hind, rufous, in continuation with the flanks, to the feet, a line on the inner side of the forearms and thighs white.

Skull smaller than in the allied species, of normal proportions, not elongated.

Dimensions of the type:—

Hind foot (c. u.) 165 mm.

Skull: greatest length 115; basal length 99.5; greatest breadth 51.5; nasals 39×20.5 ; breadth of brain-case 41.5; muzzle 36.5; palatal length 57; length of upper tooth-series 32.5, of molars only 18.3.

Horns 36×12 .

Hab. Kole, Upper Lukenye R., South Central Congo.

Type. Adult male. B.M. no. 9. 12. 12. 13. Collected and presented by Mr. E. Torday.

By its general reddish colour this Duiker is at once separable from *C. æquatorialis*, Matsch., the other Congo species of the group, while it is distinguishable by its short skull from *C. nyasæ*, which it so closely resembles externally.

I have had much pleasure in naming it in honour of Mr. M. W. Hilton Simpson, Mr. Torday's companion during his expedition and himself a donor to the National Museum of several interesting mammals.

X.—*New African Mammals.*

By GUY DOLLMAN, B.A.

(Published by permission of the Trustees of the British Museum.)

Galago dunni, sp. n.

Related to *G. braccatus albipes*, Dollm., but larger and paler in colour in the grey parts.

Size large; hands and feet considerably larger than those of

G. braccatus, Elliot, or *G. b. albipes*. Ears rather small in proportion to size of body. Hair soft and of medium length. General colour of back pale greyish brown (smoke-grey no. 1, 'Repertoire de Couleurs'), rather darker down the middle and paler on the flanks. Individual hairs of back slate-grey, with greyish-white tips. Upper surface of fore limbs pale grey, washed over with creamy buff. Upper surface of hind limbs very similar in colour to those of *G. b. albipes*, but rather more buffy, and paler in the grey parts. Backs of hands and feet yellowish (Naples yellow no. 2, 'Repertoire'). Underside of body and fore limbs white, washed over with cream-colour; under surface of hind limbs greyish white, tinted with yellow, but not so rich in colour as in *G. braccatus*. Tail above similar in colour to back, apical half rather browner; under surface paler and greyer.

Skull large and strongly built. Nasals very broad anteriorly, narrowing towards the middle, and spreading out again posteriorly.

Dimensions of the type (measured in the flesh):—

Head and body 200 mm.; tail 275; hind foot 72; ear 38.

Skull: greatest length 48; zygomatic breadth 34·5; basilar length 33·5; nasals, greatest length 14, greatest width 4·9, least width 2·4; palatilar length 14·7; length of upper tooth-row from front of first premolar to back of last molar 13·3.

Hab. Fafan, 35 miles east of Harrar, Somaliland.

Type. Old male. B.M. no. 4. 5. 9. 1. Original number 128. Collected by Major H. N. Dunn on November 18th, 1903, and presented by him to the British Museum.

This species is easily distinguished from *G. braccatus* by its larger size and much lighter grey-coloured upper surface.

Galago talboti, sp. n.

In general appearance somewhat similar to *G. elegantulus*, Lec., but differing in having a buffy-white under surface instead of dark slaty grey.

Size and general proportions as in *G. elegantulus*. Hair soft and very thick. General colour of back pale brownish red (dark fawn no. 2, 'Repertoire de Couleurs'), rather richer on the flanks and rump. Median dorsal stripe well defined; brownish orange in colour (burnt umber no. 2, 'Repertoire'). Individual hairs of back dark slaty grey for basal half, becoming paler and yellower towards middle; apical portion buffy brown. Face and sides of head reddish buff (between dead leaf no. 1 and cinnamon no. 1, 'Repertoire'). Top of

head greyish buff mixed with red (between otter-brown no. 3 and mineral brown no. 1, 'Repertoire'), greyer on the neck and back between shoulders. Sides of neck behind ears greyish white. Upper surface of fore limbs greyish red. Upper surface of hind limbs very similar in colour to back, paler and rather yellower. Backs of hands and feet yellowish white. Underside of body buffy white; hairs on chest and down middle of belly grey at base. Sides of belly pure buffy white, strongly contrasting with the reddish-brown flanks. As in *G. elegantulus*, the light-coloured fur of the belly extends upwards for a short distance towards the dorsal surface in the region of the axillæ and on the flanks just anterior to the insertion of the hind limbs. Throat reddish, the hairs with grey bases and red tips. Under surface of fore limbs pure buffy white; under surface of hind limbs very similar in colour, but the hairs are greyish at their bases. Upper side of tail brownish buff, washed over with grey, rather greyer towards the tip. Individual hairs of tail greyish buff at base, apical half brownish (warm sepia no. 2, 'Repertoire'), tip light greyish buff.

Skull rather broad and strongly built; muzzle well developed, zygoma very broad, measuring nearly 6.5 mm. across jugal region.

Dimensions of the type (measured in the flesh):—

Head and body 166 mm.; tail 274; hind foot 64; ear 31.

Skull: greatest length 49.4; zygomatic breadth 35.7; basal length 37.5; condylo-basal length 43; nasals, greatest length 13.4; greatest breadth 4; palatal length 18.5; length of upper tooth-row from front of first premolar to back of last molar 14.

Hab. Nkami, Southern Nigeria. Altitude 600 feet.

Type. Adult male. Original number 23. Collected by Mr. P. A. Talbot on October 22nd, 1909.

On account of the great differences in colour, especially of the underparts, this Nigerian form must be considered quite distinct from *G. elegantulus*, and deserving of specific rank. *G. elegantulus pallidus*, Gray, is readily distinguished from this new species by its dull greyish under surface, greyer back, and much larger size.

Galago elegantulus tonsor, subsp. n.

Allied to *G. elegantulus*, Lec., but much paler in colour.

Size and general proportions similar to *G. elegantulus*. Hair soft and very thick, especially on the under surface. General colour of back pale orange (cinnamon no. 2, 'Repertoire de Couleurs'). Median dorsal line indistinct, rather

richer in colour than rest of back. Individual hairs of back slaty grey, with buff tips. Flanks similar in colour to back. Face and sides of head grey; top of head grey, washed over with pale buff. Upper surface of fore limbs grey mixed with buff. Upper surface of hind limbs yellowish grey (near snuff-brown no. 1, 'Repertoire'). Backs of hands and feet grey. Underside of body and limbs greyish white. Individual hairs of belly slate-grey, with whitish tips. The grey colour of the under surface extends upwards on the flanks in the region of the axillæ and just in front of the hind limbs, as in *G. elegantulus* and the foregoing species. Upperside of tail greyish buff for basal half, apical portion grey, tip white. Individual hairs at root of tail pale grey for basal half, remainder buff-coloured. Individual hairs on apical portion dark greyish brown (dark neutral tint no. 1, 'Repertoire'), with whitish tips. Underside of tail grey, basal region washed over with buff.

Skull a good deal smaller than that of the foregoing species. Nasal region short.

Dimensions of the type (measured in the flesh) :—

Head and body 215 mm.; tail 280; hind foot 61; ear 30.

Skull: greatest length 45·4; zygomatic breadth 36; basal length 35; basilar length 33; condylo-basilar length 38·5; greatest length of nasals 11·6; palatal length 17·3; length of upper tooth-row, from front of first premolar to back of last molar 13.

Hab. 15 miles from mouth of the Benito River, Spanish Guinea, West Africa.

Type. Adult female. B.M. no. 98. 5. 4. 1. Original number 334. Collected by Mr. G. L. Bates on February 4th, 1898.

In addition to the type and a further specimen from the Benito River, Mr. Bates has collected two specimens referable to this new form at Efulen, in the Cameroons.

The striking difference in colour between Mr. Bates's series and the *G. elegantulus* obtained by Du Chaillu indicates that they must be regarded as subspecifically distinct.

Elephantulus dundasi, sp. n.

Related to *E. somalicus*, Thos., but more buffy on the flanks.

Size and general proportions similar to *E. somalicus*. General colour of back yellowish brown (snuff-brown no. 2, 'Repertoire de Couleurs'), paling to a pure buff tint (cinnamon no. 1, 'Repertoire') on the flanks. Sides of face and

top of head as in *E. somalicus*. Nape of neck rather darker in colour, the light buff-coloured patches restricted to the areas just behind the ears. Back of hands and feet white, a few yellowish hairs intermingled with the white on the feet. Underside of body and limbs white, rather buffy on chin and throat. Individual hairs of belly slate-grey at base, terminating in a long white tip. Upper surface of tail darker than in *E. somalicus*, the buffy tint predominating only at base. Lower surface of tail greyish white.

Skull like that of *E. somalicus*; nasals rather longer and auditory bullæ larger; last upper molar small.

Dimensions of the type (measured in skin):—

Head and body 135 mm.; tail 111; hind foot 32; ear 24.

Skull: basal length 32·3; condylo-basal length 34·3; zygomatic breadth 20·5; length of nasals 15; palatilar length 18; length of upper tooth-row, from front of first incisor to back of last molar, 19.

Hab. Harich, near Lake Baringo, British East Africa. Altitude 3000 feet.

Type. Adult. B.M. no. 9. 5. 13. 3. Original number 2. Collected in December 1908 by Mr. K. R. Dundas, and presented by him to the British Museum.

In addition to the type Mr. Dundas obtained a second specimen from the same locality, quite similar in colour to the type.

This Baringo species may be regarded as allied to the Somaliland form *E. somalicus*, but is distinguished by the more buffy coloration of the flanks and darker upperside of the tail. From *E. boranus*, Thos., it is readily separated by its far paler upper surface and pure white belly.

I have named this species after Mr. K. R. Dundas, whose collections from Baringo and Mumias have proved to be of considerable interest and of great value as regards the geographical distribution of some of the East-African mammals.

Grophurus raptor, sp. n.

Allied to the Ruwenzori species recently described by Thomas and Wroughton, but rather darker in colour and with a very much broader skull.

Fur soft and of medium length, measuring about 7 mm. in length on back. General colour of upper surface dark brown (sepia no. 1, 'Repertoire de Couleurs'), slightly paler on the flanks. Individual hairs of back dark grey (Payne's grey no. 4, 'Repertoire') at base, tips brownish buff. Face, sides of head, and region just behind ears greyish buff. Eyes

surrounded by dark rings; no dark line between eyes and ears. Backs of hands and feet greyish brown; toes dark brown. Underside of body dark slaty grey, washed over with greyish white. Hairs of belly dark slate-coloured, with greyish-white tips. Tail rather lighter in colour than back; lower surface greyer, especially near the base.

Skull very broad across middle of zygomatic region. Auditory bullæ comparatively small. Cranial region broad. Nasals rather short, and broad anteriorly.

Dimensions of the type (measured in the flesh):—

Head and body 94 mm.; tail 68; hind foot 16·5; ear 13.

Skull: greatest length 27; condylo-basal length 25; basal length 23; condylo-basilar length 23; basilar length 21; zygomatic breadth 16; breadth of brain-case behind squamosal region 13; greatest length of nasals 10·5; palatal length 10·7; palatilar length 9; width of palate between last molars 3·8; length of palatal foramina 3; length of upper molar series 3·4.

Hab. West slope of Mount Kenya, British East Africa. Altitude 11,000 feet.

Type. Adult male. B.M. no. 0. 2. 1. 17. Original number 19. Collected on August 22nd, 1899, by Mr. H. J. Mackinder.

The darker-coloured fur and unusual breadth of the skull, especially as regards the zygomatic region, necessitate this Kenya *Graphiurus* being considered quite distinct from the Ruwenzori species.

XI.—*Preliminary Description of a new Genus of Epomophorine Bats.* By KNUD ANDERSEN.

PLEROTES*, gen. nov.

Type, *Plerotes anchietæ* = *Epomophorus anchietæ*, Seabra, J. Sci. Lisboa, (2) vi. p. 116 (1900), from Galanga, Benguela.

Differential characters.—Allied to *Epomops*, with the post-dental palate flattened as in *Megachiroptera* generally, not

* Πληρωτής, filling out (e. g. a gap, an interspace), in allusion to the fact that in the number of postcanine teeth ($\frac{2}{6}$) *Plerotes* is intermediate between the Rousettine group of genera ($\frac{5}{6}$) and the hitherto known genera of the *Epomophorine* group ($\frac{3}{6}$).

deeply hollowed out posteriorly as in *Epomophorus*, but peculiar in the following respects :—

(1) Cheek-teeth $\frac{4}{5}$: p^1 and m_3 present. In all other *Epomophorine* genera cheek-teeth $\frac{3}{5}$: p^1 and m_3 absent.

(2) Dentition on the whole exceedingly weak; p^3 — m^1 and p_3 — m_2 unusually narrow, only half, or less than half, as broad as long (anterior-posteriorly). Dentition of *Epomops* scarcely weaker than usual in the *Epomophorine* group; breadth of cheek-teeth two-thirds their length.

(3) p^1 , m^1 , p_4 , m_1 , and m_2 very low, almost perfectly flattened, with no trace of the usual cusp-like elevations of the outer and inner ridges, upper teeth with a slight, lower teeth with a scarcely detectable remnant of the median longitudinal groove. Cheek-teeth of *Epomops* unmodified *Epomophorine*, with well-developed lateral ridges and median groove.

(4) Outer and inner ridge of p^3 and p_3 so completely fused as to leave scarcely any trace of a median groove. *Epomops*: outer and inner ridge of p^3 and p_3 never so completely fused as to obliterate the median groove.

(5) Upper incisors extremely small, barely piercing gum, crown blunt; lower incisors simple, obtuse. *Epomops*: upper incisors not reduced, crowns acutely pointed; lower incisors distinctly bilobed.

(6) Palate unusually broad, breadth across outer surfaces of crowns of m^1 — m^1 more than total length of maxillary tooth-row (c— m^1). Palate of *Epomops* broader than in *Rousettus*, but not broadened to the same degree as in *Pterotes*, breadth across outer surfaces of crowns of m^1 — m^1 less than total length of maxillary tooth-row.

(7) Brain-case considerably deflected against facial axis. In all other *Epomophorine* genera only very slightly deflected.

(8) Soft palate crossed by eight thin, serrate, almost equidistant ridges forming regular curves from side to side (figured by Seabra, J. Sci. Lisboa, (2) v. pl. i. fig. 3, 1898). Three anterior (interdental) palate-ridges of *Epomops* thick and prominent, conspicuously contrasting with thin and serrate postdental ridges.

(9) Interfemoral extremely narrow laterally, breadth at middle of tibia scarcely more than that of tibia bone; calcar absent (or rudimentary; the only known specimen is mounted). Interfemoral of all other *Epomophorine* genera unmodified, breadth at middle of tibia four to five times that of tibia bone; calcar well developed.

(10) Metacarpal of second digit much less (in *Epomops* much more) than half the length of the forearm; fourth (in *Epomops* third) metacarpal longest; second phalanx of third

digit subequal to (in *Epomops* much shorter than) metacarpal of same digit.

(11) Vertical fasciæ of mesopatagium few (about 7-8) and broadly spaced. In *Epomops* unusually numerous (36-47) and crowded.

General size of single species known very small, as *Micropteropus pusillus*: forearm about 50-60 mm. Size of known species of *Epomops* much larger: forearm 82-100.5 mm.

Small whitish hair-tufts at anterior and posterior base of ears, as in all Epomophorine genera.

For the loan of the type of this highly interesting fruit-bat I am indebted to Sr. A. F. de Seabra, Museu Bocage, Lisbon. The specimen is a fully adult female, teeth practically unworn.

XII.—On some Species of the Genus *Epomops* *.

By KNUD ANDERSEN.

I. *Epomops franqueti* and *comptus*.

Epomophorus franqueti, Toms, P. Z. S. 1860, p. 54, pl. lxxv.—Type locality, Gaboon. Type, in the Paris Mu-

* *Epomops*, originally founded by Gray (1866), was by Dobson (1878) not distinguished from *Epomophorus*; by Matschie (1899) it was allowed to stand as a "subgenus" of *Epomophorus*, but by Miller (1907) again united with *Epomophorus*, probably owing to its general resemblance to the latter genus in dentition and external aspect. I find myself compelled to disagree with Miller. Both *Epomops* and *Epomophorus* subsist on soft fruits, but in having adapted themselves to this diet they have, in certain respects, followed essentially different lines of development. In *Epomops* the rostrum and palate are broadened, in *Epomophorus*, on the contrary, unusually narrow; in *Epomops* the postdental palate has preserved the common "Rousettine" (flattened) shape, in *Epomophorus* it is deeply hollowed out posteriorly; in *Epomops* the three anterior interdental palate-ridges are thick and prominent, conspicuously contrasting with the thin and serrate postdental set of ridges, in *Epomophorus* the whole set of ridges are peculiarly modified, without contrast between the interdental and postdental ridges; also the hyoid bones and pharyngeal sacs are different in the two genera. *Epomops* is in fact much more closely related to *Hypsignathus* and *Pterotes* than it is to *Epomophorus*. If we leave *Epomops* and the short-nosed (in the skull almost *Cynopterus*-like) *Micropteropus* in *Epomophorus*, then *Epomophorus* becomes decidedly the most heterogeneous genus of fruit-bats; if we separate *Epomops* and *Micropteropus*, then *Epomophorus* stands as a perfectly homogeneous group, sharply defined against all other genera of the Epomophorine section, and in the shape of the postdental palate contrasting even with all other genera of Megachiroptera.

seum, an adult male, mounted skin, skull extracted, soft palate destroyed, two pairs of upper incisors. Skull figured in P. Z. S. 1861, pl. i. fig. 3. Type examined.

Epomophorus comptus, H. Allen, Proc. Ac. N. Sci. Philad. 1861, p. 158.—Type locality, according to Allen, "W. Africa"; as belonging to Du Chaillu's collections the specimen was no doubt obtained in Gaboon; type in the collection of the Academy of Natural Sciences, Philadelphia. All that can be seen from Allen's long description is that *E. comptus* must be an *Epomops*, not an *Epomophorus*, and that the single specimen he had before him must have been a female (he does not mention the sex). Now, the fact that the type locality of *E. comptus* is the same as that of *E. franqueti* easily suggests the idea, if not, perhaps, *E. comptus* is simply the female of *E. franqueti*. Allen does not seem to have known the description of *E. franqueti*, in any case he does not compare *E. comptus* with that species, but only with *Epomophorus* "*gambianus*" and "*schoënsis*." But even if Allen had known Tomes's description, it is doubtful if he would have identified Du Chaillu's specimen with *E. franqueti*, considering that the type of *franqueti* is a large male, that of *comptus* a small female; the sexual difference, in size as well as in certain other characters, is in *Epomops* considerable. I may add that my suspicion as to the possible identity of *E. comptus* and *franqueti* was strengthened by the circumstance that, although I have had the privilege of examining a larger series of *Epomops* than any other single writer, I have never been able to find more than one species of the present genus in Gaboon or in the neighbouring countries to the north, east, and south. All doubt has now been removed by the additional information most kindly sent me by Mr. James A. G. Rehn, Philadelphia, after a re-examination of the type of *E. comptus*. It is a female of *E. franqueti*; all the decisive characters and measurements entirely agree with those of females of the eastern race of that species, *E. f. franqueti*. The type is an unmounted skin, skull extracted, soft palate destroyed; as mentioned by Allen, a single pair of upper incisors (actually lost, but alveoli present); forearms broken, hence the extraordinarily small measurement of the forearm given by Allen (3 in.=76 mm.); from the measurement of the third metacarpal given by Rehn (in litt.), viz. 60 mm., it may safely be said that the real length of the forearm has been not less than 85 mm.—Mammalogists will no doubt feel some pleasure in being able to put *E. comptus* down as a synonym of *E. franqueti*. Those who, with Dobson's Catalogue as a guide, have tried to identify a

specimen of *Epomops*, will rather too often have made the experience that they had better give it up, for the specimen would agree with neither of the diagnoses offered in that book.

Dobson's method of discriminating E. comptus from E. franqueti.—Dobson gave the following brief diagnoses of the two "species" (his reference to the different "mode of attachment of the wings to the toes" may be left quite out of consideration here; the insertion of the membranes is the same in all forms of *Epomops*). *E. comptus*: third palate-ridge complete, undivided; a single pair of upper incisors in adults. *E. franqueti*: third palate-ridge developed on sides only [*i. e.* broadly separated in middle]; outer incisors wanting only in very old individuals. As these diagnoses have been universally accepted, without or with (Matschie) hesitation, for more than thirty years, it may perhaps be of some interest to trace them back to their origin. It is evident that Dobson cannot have taken them from Tomes's or Allen's descriptions, for neither of these authors mentions the palate-ridges; nor can he have known the palate-ridges from personal examination of the types nor from secondhand information, for in both of the type-skulls the soft palate has been destroyed. The explanation is this:—

Dobson's material of *Epomops* was exceedingly limited, only four specimens, one from Sierra Leone, two from Gaboon, and one without locality, all adults. In one of these, a female from Gaboon (Cat. Chir. p. 14, specimen "a"), he found only one pair of upper incisors; as this character agreed with Allen's description of *E. comptus* ($\frac{1}{2}$ — $\frac{1}{2}$ incisors), he naturally identified this specimen with *E. comptus*, and finding in the same specimen the third palate-ridge continued uninterrupted across the palate, he combined these two facts into the diagnosis of *E. comptus* referred to above: third ridge undivided, only one pair of upper incisors in adults. In two of the three other specimens (the third is senile and has lost all incisors above and below), as well as in Tomes's figure of the type skull of *E. franqueti* (or perhaps by actual examination of this latter during one of his visits to Paris), he found two pairs of upper incisors, and in one of the specimens, viz. that from Sierra Leone (p. 13, specimen "a"), the third palate-ridge broadly interrupted in the middle; this is the basis of his diagnosis of *E. franqueti*: third ridge divided, outer upper incisors present "except in very old individuals." But he overlooked the important fact that in two of the three specimens referred by himself to *E. franqueti* (p. 13, "b" and "c") the third ridge is, contrary to his diagnosis of that species, undivided in the middle!

In the light of the now available much completer material, Dobson's four specimens must be identified as follows:—His "*E. franqueti*" from Sierra Leone (p. 13, "a"), the only one with the third palate-ridge divided in the middle, is a distinct species, *E. buettikoferi*; his two other specimens of "*E. franqueti*" (p. 13, "b" and "c") and the only specimen referred by him to "*E. comptus*" are all *E. franqueti franqueti*.

II. Third Palate-ridge in *E. franqueti* and *buettikoferi*.

It will be noticed from the above that Dobson's statement that in some individuals of the present genus the third palate-ridge is continued uninterrupted across the palate, in others distinctly divided in the middle, is by no means without foundation in facts. Only the difference is not, as believed by Dobson, a difference between *E. comptus* and *franqueti*, which, on the contrary, are but two names of one species, but between *E. franqueti* (ridge undivided) and *E. buettikoferi* (ridge divided). The character would be very convenient indeed for a ready discrimination of these two species, if it were absolutely constant. It is so in the large majority of cases; it is perhaps always so in the case of *E. buettikoferi*, but individuals of *E. franqueti* occur, although apparently very rarely, in which the ridge is distinctly divided in the middle.

In p. 104 of the present paper I give a tabular record of the condition of the third palate-ridge in twenty-six skulls of *E. franqueti* and *buettikoferi*. A larger number of skulls has been examined, but those tabulated are the only ones in which the palate-ridges have been preserved in sufficiently intact condition. The results are these:—

(1) The condition of the ridge, whether continuous or divided, is entirely independent of the presence or absence of the outer pair of upper incisors (i^2). Dobson's contention that the presence of i^2-i^2 in adult individuals is associated with a divided third ridge (his *E. franqueti*) and the absence of those teeth with an undivided ridge (his *E. comptus*) is clearly untenable.

(2) The palate-ridges have been examined in twenty-two individuals of *E. franqueti*, representing both subspecies and localities dotted over nearly the whole area inhabited by the species. In twenty-one of these individuals the third ridge is practically undivided in the middle, either absolutely continuous [indicated in the table by the word "Undivided,"

without brackets] or, not infrequently, with a distinct notch at the middle suggesting an initial stage towards a splitting of the ridge [indicated by "(Undivided)"]. In one single individual the ridge is distinctly separated in the middle, by a space about equal to the breadth of p^4 ; this individual (Kradji, Togo) is in every other respect a typical *E. f. strepitans*.

(3) The palate-ridges have been examined in four skulls of *E. buettikoferi*, including the type of the species. In all the third ridge is broadly divided in the middle.

The fact that the condition of the third palate-ridge is not absolutely diagnostic does not in the least affect the validity of *E. buettikoferi* as a distinct species. It differs in other and more important characters from *E. franqueti*.

III. Outer Upper Incisors.

Material,—thirty adult skulls of *E. franqueti* (both subspecies) and *E. buettikoferi*; see table, p. 104.

In eleven of these i^2 is present on both sides; in five present on one side only; and in fourteen absent on both sides. i^2 is present in all perfectly immature individuals examined (not recorded in the table), but as soon as the individuals are full-grown the presence or absence of the outer upper incisors appears to be independent of the age. If the loss of i^2 were entirely or chiefly an age character, we should expect to find these teeth present chiefly in adult individuals with unworn teeth, absent chiefly in individuals with worn teeth. But the facts are not in favour of this assumption. Of the eleven skulls with i^2 present on both sides, no less than eight have the cheek-teeth conspicuously worn (marked with one asterisk in the table) or even much worn (two asterisks); of the fourteen skulls with i^2 absent on both sides (and their alveoli obliterated) two are only young adults (*i. e.* full-sized, but with distinct signs of slight immaturity), and four, though fully adult, have the teeth quite or nearly unworn (no asterisk in the table).

To decide, with certainty, the question whether there is any specific or subspecific difference in the deciduousness of i^2 would require a much larger material than at present obtainable. But so far as this material goes, i^2 appears to be much more frequently lost in *E. f. franqueti* than in *E. f. strepitans* and *E. buettikoferi*. The subjoined table points decidedly to this conclusion, but it is admitted that the number of skulls of *E. f. strepitans* and *buettikoferi* is too small for generalizations of this kind:—

	Skulls examined.	Both i^2 present.	One i^2 absent.	Both i^2 absent.
<i>E. f. franqueti</i>	18	17 pct.	11 pct.	72 pct.
<i>E. f. strepitans</i>	7	57	29	14
<i>E. buettikoferi</i>	5	80	20	0

Third Palate-ridge and Outer Upper Incisors †.

		Third palate-ridge.	i ² -i ² .
<i>E. f. strepitans.</i>			
♀	imm. Gold Coast	(Undivided.)	
♂	ad. " "	Undivided.	++
♂	ad. Togo: Kradji	Divided.	+÷**
♂	ad. Lagos	Undivided.	++
♂	ad. S. Nigeria: Abonnema..	....	++*
♂	ad. " " .....	....	+÷*
♂	ad. " Asaba	Undivided.	÷÷*
♂	ad. " " (type) .....	....	++*
♂	imm. " Oban	Undivided.	
<i>E. f. franqueti.</i>			
♂	ad. Old Calabar	Undivided.	÷÷**
♂	ad. " "	(Undivided.)	+÷*
♂	ad. Cameroons	Undivided.	÷÷
♂	ad. " "	Undivided.	÷÷
♂	ad. " Bitye, R. Ja.	Undivided.	÷÷*
♂	yg. ad. " Victoria	Undivided.	÷÷
♂	ad. " Kribi	Undivided.	
♂	juv. " Yaunde	Undivided.	
♂	yg. ad. " "	Undivided.	÷÷
♂	ad. " Aqua Town ..	Undivided.	++*
♂	ad. " Bipindi	(Undivided.)	÷÷
♂	juv. Benito R.	(Undivided.)	
♂	ad. Gaboon (type) .....	....	++*
♂	ad. " (type of <i>comptus</i>) .....	....	÷÷*
♂	ad. " Dongila.....	Undivided.	++**
♂	ad. " Elloby	Undivided.	÷÷*
♂	ad. " Como R. ....	....	÷÷**
♂	ad. Loanda: Malange	(Undivided.)	÷÷*
♂	ad. Monbuttu: Tingasi	Undivided.	÷÷*
♂	ad. Semliki R. ....	....	÷÷
♂	ad. Bukoba, Victoria Nyanza	....	+÷
<i>E. buettikoferi.</i>			
♂	ad. Sierra Leone	Broadly div.	++**
♂	ad. " "	Broadly div.	++*
♂	ad. Liberia	Broadly div.	+÷
♂	ad. " (type)	Broadly div.	++
♂	ad. " " .....	....	++*

† Explanations to the table:—Undivided=perfectly continuous across the palate. (Undivided)=practically undivided, but with a distinct notch in the middle, suggesting an initial stage towards separation. ++= i^2 present on both sides. +÷= i^2 present on one side only. ÷÷= i^2 absent on both sides. No asterisk=teeth quite or nearly unworn. * teeth conspicuously worn. ** teeth much worn.

IV. *Epomops buettikoferi*.

Type locality, Liberia; type (examined) in the Leyden Museum. Described by Matschie (Megachir. p. 45; 1899) as an *Epomophorus* (as distinct from *Epomops*), and more particularly as a Liberian representative of "*Epomophorus macrocephalus*." Matschie had not seen the specimen, but relied on some external measurements found in literature. The type represents in reality a distinct species of *Epomops*, and its true characters are entirely different from those given by Matschie. The species is thus far only known from Sierra Leone and Liberia, but may have a wider distribution along the Guinea coast.

V. *The Subspecies of Epomops franqueti*.

Forty-six specimens of *E. franqueti* have been examined, in the collections of the Leyden, Berlin, Paris, and British Museums, from the following localities:—Gold Coast (eleven), Togo (one), Lagos (one), S. Nigeria (Asaba, Abonnema, Oban: six), Old Calabar (three), Cameroons (Bitye, Victoria, Kribi, Yaunde, Aqua Town, Mungo, Bipindi, Klein Batanga: twelve), Spanish Guinea (one), Gaboon (Dongila, Elloby, Como R.: four), Loanda (Malange: one), Niam-Niam (one), Tingasi (one), Semliki R. (one), Bukoba (one), uncertain localities (two).

They represent two fairly well-marked geographical races. The specimens from the Gold Coast, Togo, Lagos, and S. Nigeria average conspicuously smaller than those inhabiting the area from Old Calabar south to Loanda and east to Victoria Nyanza. Any other difference than that of size I am unable to see, and, as shown in the subjoined table, this average difference is much better pronounced in the skull than in the external dimensions, and much better so in males than in females; specimens of the latter sex are sometimes difficult to allocate to subspecies:—

	Smaller race. Males.	Larger race. Males.	Smaller race. Females.	Larger race. Females.
Skull, total length	46·8-48	49-53	41·8-43·5	43-47 mm.
Mandible	36-39	40-43	?-?	33·8-38 "
c-m ¹ , crowns	14·5-16·2	16·5-18	14·5-14·8	14·8-16·7 "
Forearm	88-89·5	90·5-96	84·5-85	82-93 "
3rd metacarpal ..	62·5-65·5	67-70	60-60·5	60-66 "
Ear, length	22-24	23-25	21·5-?	23·5-25·5 "
Tibia	31·5-35	33·5-37·5	?-?	32-34·5 "

The larger race will have to stand as *E. f. franqueti*, the smaller race may be known as

Epomops franqueti strepitans, subsp. n.

Type, ♂ ad., skin and skull, Asaba, S. Nigeria; presented by Dr. W. H. Crosse; B.M. 95. 5. 3. 7.

XIII.—*New African Mammals of the Genera Cricetomys and Procavia.* By R. C. WROUGHTON.

A CAREFUL comparison of the skins and skulls of specimens of the genus *Cricetomys* shows that at least two new forms require names. Until more complete material is available for study it seems most convenient to rank them as geographical races of *C. gambianus*.

Cricetomys gambianus emini, subsp. n.

A *Cricetomys* closely resembling *C. gambianus* (s. s.) in size and colour; with stouter teeth, larger palatal foramina and bullæ.

Fur rather harsh, 15 mm. long on back; individual hairs greyish white, with apical third brown. General colour above Mars-brown, paling to near "vinaceous cinnamon" on flanks; belly pure white. Arms and legs like back above, fingers and toes pure white. Slightly less than basal half of tail like back, remainder white.

Skull as in typical *gambianus*, but teeth larger, palatal foramina longer, bullæ somewhat smaller.

Dimensions of the type (measured on the skin):—

Head and body (c.) 400 mm.; tail (c.) 370; hind foot 72.

Skull: greatest length 75; basilar length 65; zygomatic breadth 36; nasals, length 32; palatal foramina 9; diastema 25; greatest breadth of m^1 3.5; upper molar series 11.5.

Hab. Gadda, Mombattu.

Type. Adult male. B.M. no. 87. 12. 1. 55. Collected February 1884, and presented to the Natural History Museum by Emin Pasha.

The stout teeth and large palatal foramina distinguish *emini* from typical *gambianus*, and its bright colouring prevents any confusion with the next form.

Cricetomys gambianus proparator, subsp. n.

A *Cricetomys* about the size of typical *gambianus*, less brightly coloured, major part of tail white, and having markedly larger teeth.

Fur rather softer than in *emini*, 15 mm. long on back; individual hairs with basal two-thirds greyish white, apical third brown. General colour on the flanks "fawn," much darker on the middle of back. Arms and legs rather darker than flanks, whole hand and toes white. Almost three-fourths of tail white.

Skull with even stouter teeth than in *emini*, palatal foramina shorter, only slightly larger than in *gambianus* (s. s.), premaxillary suture cutting foramina at their posterior extremity (often at their centre in *gambianus*).

Dimensions of type:—

Head and body 350 mm.; tail 418; hind foot 72; ear 42.

Skull: greatest length 76; basilar length 63; zygomatic breadth 34; nasals, length 32; palatal foramina 7.5, diastema 24.5; greatest breadth of m^1 3.6; upper molar series 12.

Hab. East Ruwenzori. Alt. 6000 feet.

Type. B.M. no. 6. 7. 1. 63. Original number 612. Collected by R. B. Woosnam, 1st January, 1906. Presented by the Ruwenzori Exploration Committee.

The very large proportion of white tail-length, dull coloration, and the skull-characters noted above serve to distinguish this from any other form of *Cricetomys*.

In order to determine some specimens recently received by the Natural History Museum from Mlanji in Nyasaland all the specimens of *P. brucei* were laid out, and it then became evident that series of specimens from four different localities representing distinct geographical races required names.

Procavia brucei hindei, sp. n.

A *Procavia* of the *Heterohyrax* group, differing from *P. brucei* by its darker and redder colouring and by the formation of the posterior palate.

Fur medium, 25–27 mm. on the back. General colour above "Mars-brown" ticked with whitish; individual hairs pale seal-brown fading to russet, subapical 3–5 mm. cream-buff, very short black tip. Belly and chest pure white, chin and throat tending to become grey (though pure white in some cases). Face coloured like back, but the obsolescence

of the pale tips of the hairs between the eyes making it darker. Superciliary and dorsal marks cream-buff (or the latter a little darker). Hands and feet a finely grizzled copy of the flanks.

Skull in general outline slightly broader than in *P. brucei*, especially noticeable in the nasals and across the forehead. A pair of protuberances on the posterior margin of the palate, one on each side of the usual central, posteriorly directed process; this process itself often raised above the palate-floor.

Dimensions of type (measured on the skin):—

Head and body 450 mm.; hind foot 63.

Skull: greatest length 83; basilar length 73; zygomatic breadth 47·5; nasals, length 19, posterior breadth 18; anterior breadth 8; diastema 10; upper molar series 29.

Hab. Fort Hall, Kikuyu, British East Africa.

Type. Old female (Stage VIII.). B.M. no. 3. 11. 1. 13. Original number 143. Collected by Mr. S. L. Hinde on 19th March, 1903, and presented to the National Collection.

Five specimens examined. The coloration is constant throughout the series, and the dark face is in marked contrast to the type of *P. brucei*. The curious palatal character noted above is also quite constant.

Procavia brucei ruddi, sp. n.

A dassie of the "*brucei*" group, slightly larger than the last, from which it also differs in colour and its soft loose coat.

Fur of back 30–35 mm. long. Basal third of individual hairs drab-grey, second third fawn-colour, terminal third black, with a subapical band 4–5 mm. long, whitish. General colour a coarse mixture of brown and whitish, with a distinct black suffusion in the mid-dorsal region. Paling to a light brownish white on the flanks, but nevertheless sharply separated from the pure white belly. Face and nape between the eyes and ears brown (the pale ends of hairs missing), much suffused with black; sides of throat, shoulders, arms, and legs like flanks. Chin white, throat buffy white. Superciliary and dorsal marks cream-buff.

Skull as in *P. hindei*, but rather broader and stouter, the bony tubercles on the palation scarcely marked or absent.

Dimensions of the type:—

Head and body 510 mm.; hind foot 68; ear 29.

Skull: greatest length 83; basilar length 73; zygomatic breadth 49; nasals, length 20, posterior breadth 17, anterior breadth 8; diastema 11; upper molar series 31.

Hab. Tambarara, Gorongoza Mts., Portuguese East Africa.

Type. Adult female (Stage VII.). B.M. no. 8. 1. 1. 116. Original number 1930. Collected 12th May, 1907, by C. H. B. Grant, and presented to the Natural History Museum by Mr. C. D. Rudd.

The colouring and texture of the coat serve to separate *ruddi* from *hindei* at a glance.

Procavia brucei granti, sp. n.

A dassie allied to the two last, slightly larger, with long fur, which, however, is harsher than in *ruddi* and differently coloured.

Fur of back 30 mm. long. Basal half of individual hairs drab-grey, distal half whitish, dark brown, and cream-buff in equal lengths (the last, however, including a short black tip). General colour above a blackish brown grizzled with buffy, fading on the flanks and thence into the dirty white of the belly. Face and crown like back (but more finely grizzled) and slightly suffused with black. Shoulders, sides of neck, and limbs like flanks. Under lip white, chin and throat buffy drab. Dorsal mark tawny ochraceous; superciliary mark white.

Skull stout and broad, markedly larger than in *hindei*, without any trace of palatal tubercles so characteristic of that species.

Dimensions of the type:—

Head and body 504 mm.; hind foot 72; ear 32.

Skull: greatest length 85; basilar length 76; zygomatic breadth 51; nasals, length 20, posterior breadth 20, anterior breadth 8; diastema 11; upper molar series 33.

Hab. Woodbush, Transvaal.

Type. Old female (Stage VIII.). B.M. no. 6. 4. 3. 102. Original number 1534. Collected by C. H. B. Grant, 9th January, 1906, and presented to the Natural History Museum by Mr. C. D. Rudd.

Procavia brucei manningi, sp. n.

A dassie of the "*heterohyrax*" group, most resembling *ruddi* in its fur and colouring, but darker. Size large.

Fur long and silky as in *ruddi*, 30–33 mm. on back; in young animals basal half almost black, followed by brown for 10 mm., remainder buffy white, except 1–2 mm. black at extreme tip. In maturity the whole hair becomes blackish,

with a subterminal ring (2-3 mm.) buffy white. On the flanks, shoulders, &c. the colour-pattern of the hairs is as in the younger animal. On the forehead, between the eyes, the hairs are almost black, but the patch does not extend backwards to between the ears. Superciliary and dorsal marks tawny, the former paler. Throat, belly, and inner side of limbs buffy white (buff in the type).

Skull stout, tuberosities on palation scarcely more than indicated. Bullæ small.

Dimensions of type (taken on the skin):—

Head and body 580 mm.; hind foot 73.

Skull: greatest length 89; basilar length 80; zygomatic breadth 54; nasals, length 21, posterior breadth 22, anterior breadth 8; diastema 13; upper molar series 35.

Hab. Mlanji, Nyasaland.

Type. Old male (Stage VIII.). Collected by Mr. Brown.

An almost equally old female, collected 23rd December, 1900, and presented to the Natural History Museum by Col. Manning, is in such bad fur that the strikingly dark coloration of this form has not been appreciated. A young female (about Stage VI.) recalls the coloration of *ruddi*, but the dorsal mark is already quite dark.

XIV.—*Diagnoses of new Species of Marine and Freshwater Shells from the Falkland Islands, including Descriptions of Two new Genera of Marine Pelecypoda.* By J. E. COOPER and H. B. PRESTON, F.Z.S.

[Plate IV.]

THE following contributions to the somewhat meagre molluscan fauna, as at present known, of the Falkland Islands are based upon material recently collected by Mr. Arthur F. Cobb. Upon microscopic examination of the hinge-teeth of two small species we have been unable to refer these to any hitherto known genera, and have therefore given diagnoses of them in the present paper.

Limnæa brunneoflavida, sp. n. (Fig. 1.)

Shell ovately fusiform, polished, opaque, yellowish brown; remaining whorls 3, convex, transversely striate with lines of growth, and bearing traces of fine, wavy, spiral striæ; sutures somewhat deeply impressed; columella white, arched,

extending into a white diaphanous callus which reaches the lip above; labrum simple, acute; aperture rather dilated, broadly ovate.

Alt. 14, diam. maj. 8 mm.

Aperture: alt. 8·75, diam. 5·5 mm.

Hab. Falkland Islands.

Separable from *L. diaphana*, King, the only hitherto recorded species from the islands, mainly by its much greater breadth, opacity, and darker colour.

All our specimens have lost the apical whorls.

Chilina falklandica, sp. n. (Fig. 2.)

Shell obtusely fusiform, smooth, slightly polished, pale yellowish olive, encircled on the upper whorls with one and on the last whorl with three rows of chestnut flame-markings; whorls 6, shouldered, sculptured with fine, transverse, closely set, rib-like lines of growth; sutures impressed, narrowly margined; umbilicus very narrow, deep, almost concealed by the reflection of the columella; columella white, descending rather obliquely, bearing a scarcely perceptible fold below and a well-defined one above, and diffused into a whitish callus which reaches the point of insertion of the labrum with the whorl above; labrum simple, acute; aperture elongately inversely auriform.

Alt. 15, diam. maj. 8 mm.

Aperture: alt. 9·5, diam. 4·25 mm.

Hab. Falkland Islands.

Some of our specimens are coated with a blackish growth, which, however, we have reason to believe is of vegetable origin. Though allied to several species from Southern Patagonia, notably *C. subcylindrica*, Sow., and *C. amœna*, Smith, we have been unable to refer the present specimens to any of these, and believe that no other species of *Chilina* has yet been recorded from the Falkland Islands.

Phetinula solidula, sp. n. (Fig. 3.)

Shell solid, globosely turbate, smooth, somewhat polished, covered with a thick, pale, pinkish-purple outer layer, beneath which the shell is highly iridescent; whorls 5, tumid, showing faint traces of spiral banding, last whorl bluntly carinate at the base; sutures impressed; umbilical area white, having an elongated, narrow, shallow depression; columella white, arched above, descending very obliquely and extending into an iridescent callus, which sometimes reaches

the lip above; labrum acute, simple; aperture subcircular; interior of shell iridescent.

Alt. 10, diam. maj. 12, diam. min. 10 mm.

Aperture: alt. 6, diam. 5.5 mm.

Hab. Falkland Islands.

Allied to *P. violacea*, King, but much more solid and globose in form; the iridescence of the shell is only visible when the thick coloured outer layer is chipped away.

Immature specimens have a very narrow oblique umbilicus, which becomes closed in the adult, leaving only the shallow depression mentioned above.

Photinula tæniata, King, var. *nivea*, nov.

Shell smaller than the typical form, pure white, exhibiting faint traces of narrow spiral banding.

Alt. 14.25, diam. maj. 18, diam. min. 14.25 mm.

Aperture: alt. 8.5, diam. 8 mm.

Hab. Falkland Islands.

Modiolarca gemma, sp. n. (Fig. 4.)

Shell irregularly oblong, somewhat polished reddish brown, marked with rather coarse concentric lines of growth; umbones anteriorly situate, neither large nor prominent; dorsal margin scarcely arched, slightly sloping; ventral margin gently rounded; anterior side rather angularly rounded; posterior margin descending abruptly.

Long. 1.75, lat. 2.75 mm.

Hab. Falkland Islands.

Modiolarca picturata, sp. n. (Fig. 5.)

Shell trapezoidal, somewhat shining, dark olive-green painted with narrow, radiate, transverse bands of reddish purple, and spotted, especially above, with irregular, round, yellowish markings, sculptured with concentric lines of growth; umbones rather large and prominent, dark purple; anterior side descending abruptly; posterior side produced, bluntly rounded; dorsal margin scarcely arched; ventral margin anteriorly slightly excavated, posteriorly rounded; interior of shell shining, dark purple throughout.

Long. 3, lat. 4.5 mm.

Hab. Falkland Islands.

Cyamium iridescens, sp. n. (Fig. 6.)

Shell elongately oblong, iridescent, white, shining, finely concentrically striate, bearing on the posterior side of either

valve an oblique blunt keel; umbones small, moderately prominent; anterior side short, sharply rounded; posterior side elongately produced, rounded above, angled below; dorsal margin straight; ventral margin angularly rounded.

Long. 3.75, lat. 7.25 mm.

Hab. Falkland Islands.

MALVINASIA, gen. nov.*

Shell small, inequilateral, subtrigonal; right valve bearing one small cardinal tooth and curved laterals on either side; left valve bearing a large, curved, club-shaped cardinal and a broad, shell-like, posterior lateral tooth, the anterior lateral in this valve being obsolete; ligament weak, internal.

Malvinasia arthuri, sp. n. (Figs. 7, 8.)

Shell subtrigonal, brownish yellow, polished, shining, marked with rather coarse concentric growth-lines; umbones somewhat eroded, not prominent; dorsal margin sloping; ventral margin rounded; anterior side sloping above, descending sharply below; posterior side produced, rounded; cardinal tooth in right valve small, pointed; anterior lateral tooth fine, curved; posterior lateral thickened above, curved, tapering below; cardinal tooth in left valve large, club-shaped, curved in an anterior direction; anterior lateral tooth obsolete; posterior lateral forming a broad, short, shelf-like projection; interior of shell whitish.

Long. 2.5, lat. 3 mm.

Hab. Falkland Islands.

The genus outwardly has all the appearance of *Nucula*; the hinge-system, however, easily differentiates it from that group.

DAVISIA, gen. nov.†

Shell small, slightly inequilateral, suborbicular; right valve bearing a slightly curved cardinal tooth, a weak anterior lateral and a broadly expanded posterior lateral; left valve bearing an obsolete cardinal tooth, an expanded anterior lateral, and a broad, straight, posterior lateral; ligament small, centrally situate.

* "*Malvinasia*," from Malvinas, the Spanish name for the Falklands.

† "*Davisia*," named after the navigator Davis, who discovered the Falkland Islands in 1592.

Davisia cobbi, sp. n. (Figs. 9, 10.)

Shell suborbicular, white, irregularly concentrically striate; umbones large, prominent; dorsal margin sloping on both sides; ventral margin gently rounded; both anterior and posterior sides sloping abruptly; cardinal tooth in right valve small, slightly curved; anterior lateral slightly elongate, weak; posterior lateral rather broadly expanded; cardinal tooth in left valve obsolete; anterior lateral expanded, curved below; posterior lateral rather broad, elongate, straight; interior of shell pure white, shining.

Long. 2.5, lat. 2.25 mm.

Hab. Falkland Islands.

The proper position of this and the preceding genus would appear to be in the family of the Erycinidæ.

Psephis foveolata, sp. n. (Fig. 11.)

Shell small, broadly subtrigonal, smooth, polished, shining, anteriorly pale flesh-colour, shading to livid purple posteriorly; umbones large, prominent; dorsal margin sloping on both sides; ventral margin rather straight; anterior side produced, rounded; posterior side still more produced, somewhat truncate; interior of shell shining, showing the external coloration through the shell.

Long. 3.5, lat. 5 mm.

Hab. Falkland Islands.

EXPLANATION OF PLATE IV.

- Fig.* 1. *Limnæa brunneoflava*, sp. n.
Fig. 2. *Chilina falklandica*, sp. n.
Fig. 3. *Photinula solidula*, sp. n.
Fig. 4. *Modiolarca gemma*, sp. n.
Fig. 5. — *picturata*, sp. n.
Fig. 6. *Cyamium iridescens*, sp. n.
Fig. 7. Hinge of *Malvinasia arthuri*, sp. n.
Fig. 8. *Malvinasia arthuri*, sp. n.
Fig. 9. Hinge of *Davisia cobbi*, sp. n.
Fig. 10. *Davisia cobbi*, sp. n.
Fig. 11. *Psephis foveolata*, sp. n.

XV.—*A new Indian Species of Muscæ.*

By ERNEST E. AUSTEN.

(Published by permission of the Trustees of the British Museum.)

AMONG some Indian Muscidæ recently received for identification from Captain W. S. Patton, M.B., I.M.S., Assistant Director of the King Institute of Preventive Medicine,

Guindy, Saidapet, South India, are three specimens of a species of *Musca*, which, although already represented in the British Museum Collection, appears to be undescribed. Though not, of course, a blood-sucking fly in the ordinary sense of the term, the species, as will be seen from Captain Patton's note on its habits, which is printed below, may quite conceivably play a part in the dissemination of micro-organisms pathogenic to animals, and it is therefore well that it should receive a name without delay. This new *Musca*, then, which I have much pleasure in naming in honour of its gifted discoverer, may be characterized as follows:—

Musca pattoni, sp. n.

♂ ♀.—Length, ♂ (14 specimens) 5·6 to 8·5 mm., ♀ (3 specimens) 6·8 to 7·8 mm.; width of head, ♂ 2·4 to 3 mm., ♀ 2·8 mm.; width of front of ♀ at vertex 1 mm.; length of wing, ♂ 5·4 to 7·6 mm., ♀ 6·25 mm.

Eyes in ♂ almost in contact in centre of front, separated by little more than greatest width of stoutest thoracic macrochaeta, sides of face in ♂, and of lower part of front, viewed from above, brilliantly white; front in ♀ of moderate width, its sides (parafrontals) each at least half as broad, or more than half as broad, as frontal stripe; thorax bronze-black, greyish or yellowish grey pollinose, dorsum longitudinally striped as in *Musca domestica*, L., median grey stripe brighter in front; abdomen ochraceous-buff* or buff, with shimmering yellowish pollinose patches, and on dorsum a clove-brown or black median stripe, at least on second and third segments, and a more or less conspicuous and often triangular clove-brown mark on apex of fourth segment; in ♀ extreme hind margins of second and third segments also clove-brown on dorsum; wings hyaline; legs black.

Head: ground-colour blackish, grey (whitish grey or pearl-grey) pollinose, sides of front (parafrontals) in ♀ with a slight yellowish tinge, distinctly grey right up to vertex when viewed somewhat from behind, posterior orbits conspicuous above (yellowish grey) in ♀, but disappearing above in ♂; occiput black; frontal stripe black, in ♀ decidedly narrower than in ♀ of *M. domestica*, L., its sides but slightly curved; palpi and proboscis clove-brown, hairs on labella yellowish; first and second joints of antennæ black or blackish, third joint clove-brown, shimmering grey

* For names and illustrations of colours, see Ridgway, 'A Nomenclature of Colors for Naturalists' (Boston: Little, Brown, & Company, 1886).

or yellowish grey, elongate, relatively narrower and distinctly longer than in *M. domestica*, arista (except buff band beyond thickened portion) and its hairs clove-brown; all hairs and bristles on head, as also on body and legs, black. *Thorax*: dark stripes on dorsum narrower in ♀ than in ♂, in which sex the two dark stripes on each side of the median grey stripe are sometimes more or less confluent; median grey stripe on dorsum usually decidedly broader than each admedian dark stripe; scutellum sometimes entirely yellowish grey pollinose, but when viewed from behind often showing a bronze-black apical spot, which may be prolonged into a broad median longitudinal stripe. *Abdomen*: bright, shimmering, yellowish pollinose patches on dorsum not visible on first segment, but on three following segments very conspicuous when viewed from certain directions, and varying in shape according to the angle from which they are seen; second and third segments each with a longitudinally elongate rectangular pollinose patch on each side of dark median stripe; on fourth segment these patches coalesce into one; a transversely elongate, semi-rectangular or partially ovate pollinose patch on each side of second, third, and fourth segment; latero-ventrally these lateral patches curve round and reach the inner ventral edges of the dorsal scutes; extreme base of dorsum of first segment, beneath scutellum, clove-brown or black, in ♂ connected by a clove-brown mark with median stripe on second segment; median stripe usually only about half as wide on third as on second segment, and often somewhat expanded on anterior margin of latter; hind border of third segment, a larger or smaller area on each side of this segment, and whole of fourth segment sometimes more or less infuscated in ♂; dark mark on apex of fourth segment sometimes connected with anterior margin, thus forming a continuation of median stripe; hypopygium of ♂ blackish, greyish pollinose. *Alar squama* in ♂ cream-coloured, *thoracic squama* in ♂ cream-buff; *squamæ* in ♀ waxen white. *Legs*: coxæ, posterior surface of front femora, and a streak on under side of middle femora, bright grey pollinose.

India and Ceylon: types of ♂ and ♀ and one other ♀ from Guindy, Saidapet, South India, 1909 (*Captain W. S. Patton, I.M.S.*); eight additional ♂ ♂ from India, precise locality uncertain (presented by the *Bombay Natural History Society*); three ♂ ♂ and one ♀ from Trincomali, Ceylon, 21. viii., 7 and 18. ix., and 9. x. 1890 (*Lt.-Col. Yerbury*); one ♂ from the vicinity of the 19th milestone on the Kandy Road, Ceylon,

22. x. 1890 (*Lt.-Col. Verbury*) ; and one ♂ from Colombo, Ceylon, October 1898 (*E. E. Green*).

The types of both sexes are in the British Museum (Natural History).

Writing on November 1st, 1909, with reference to *Musca pattoni*, Captain Patton said :—"This species breeds in cow-dung, and its pupa is *dirty white*. The fly has peculiar habits, in that it sucks the blood which oozes from the bites inflicted on cattle by *Hæmatopota* and other Tabanids, *Stomoxys*, and *Philæatomyia*. It likewise sucks the juice out of the vaccine vesicles on calves, and also the blood after the vesicles are scraped."

From *Musca domestica*, L. (syn. *M. determinata*, Walk.), *M. pattoni* can be distinguished, *inter alia*, by its usually larger size, stouter habit of body, much narrower front in the male, the greater breadth of the sides of the front in the female, and the more sharply defined median stripe on the abdomen in both sexes. The fact that the first segment of the abdomen is in both sexes for the most part ochraceous-buff or buff, instead of entirely or for the most part black or bronze-black, will serve to distinguish *Musca pattoni* from *M. corvina*, Fabr., and other species closely allied thereto. From *Musca nebulo*, Fabr.,—which, according to Captain Patton, is "the common *Musca* of Madras, breeds in horse-dung and other refuse, particularly in night-soil, and has a reddish-brown pupa,"—*M. pattoni* differs, *inter alia*, in its much larger size, in the front of the male being only half or less than half as wide, and in the presence of the clove-brown mark on the apex of the fourth abdominal segment. In *M. nebulo* the fourth segment of the abdomen, or at least its apex, is entirely pale.

XVI.—On some Points in the Nomenclature of Echinoids.

By Dr. TH. MORTENSEN.

THE nomenclature of Echinoids has received considerable attention of late years, and a great number of publications dealing more or less extensively with problems relating thereto have appeared. Unfortunately the result of these discussions has been by no means a general agreement on these questions among specialists. It is true that recently most of the authors seem to have come to an agreement on some important points; but now Lambert and Thiery, in their 'Essai de nomenclature raisonnée des Échinides' and

in their 'Notes Échinologiques' are trying to upset all that has been done, basing their conclusions on the principles that pre-Linnæan names should be accepted when binominal and that the priority rules should be interpreted as strictly and literally as possible against anything tending to make it preferable to retain names in the old familiar meaning, and that only the characters to be found also in the fossil forms should be taken into account in classification.

I am not going to discuss here all the disputed names, only remarking on a few of the more important, the main object of these lines being to bring forward a definite proposal which may, I hope, be a real step forwards along the way out of the endless discussions and the exceedingly deplorable constant rejection of names hitherto generally used, and the almost criminal perversion of the old familiar names to quite a different meaning—changes which can with comparative facility be held in memory by the specialists, but which cannot fail to be most unfortunate to all those who are not especially acquainted with the group in question, and in cases where the forms concerned are also of importance in geology, as is in so high a degree the case with the Echinoids, still more for palæontologists and geologists. Indeed, to quote (*mutatis mutandis*) from Mr. Frank Springer's address concerning the name *Encrinus*: "The results will be hopeless confusion, will benefit nobody, and cannot fail to bring ridicule upon the taxonomic methods now in vogue."

The name *Cidaris* has recently been very much discussed by Bather, H. L. Clark, Döderlein, and myself, the result being that all these authors agreed that the type of Linnæus's *Echinus cidaris* is the species hitherto generally called *Dorocidaris papillata*, and that accordingly this species should be named *Cidaris cidaris* (Linn.), *Dorocidaris* becoming a synonym of *Cidaris*. Now Lambert and Thiery, in their 'Notes Échinologiques: I. Sur le genre *Cidaris* *', maintain that the *Cidaris mauri* of Rumphius (= *imperialis*, Lamk.) should be taken as the type of the genus *Cidaris*.

Accepting for the moment that pre-Linnæan binominal names should be adopted (and I agree there is some injustice in taking Linnæus, who ranks decidedly below some of his predecessors as regards the Echinoids, as the starting-point, and that it would be really more just to start from the first binominal names, whether they be pre-Linnæan or not), it seems to me at least very doubtful whether Lambert and Thiery are right. To identify the figure in Rumphius's

* Bull. Soc. Sci. Nat. Haute-Marne, 1909.

'D'Amboinsche Rariteitskamer,' pl. xiii. fig. 4, with *C. imperialis* really appears very rash. It may equally well (or badly) represent almost any species of Cidarid. Lambert and Thiery evidently base their identification of the figure with *imperialis*, Lamk., on the supposition that this is "le seul *Cidaris* véritable des îles de la Sonde." That this is wrong need not be discussed at any length; it will be quite sufficient to call to mind the fact that De Loriol, in his paper "Échinodermes de la baie d'Amboine" (Revue Suisse de Zool. i., 1893), records three Cidarids from Amboina, viz. *Cidaris metularia*, Lamk., *Rhabdocidaris annulifera*, Lamk., and *Rhabdocidaris imperialis*, Lamk. The figure quoted in Rumphius's work might equally well be identified as representing any of these three species! The identification maintained by Lambert and Thiery, by which is rejected what is otherwise almost unanimously accepted, is thus based on an old bad figure, of which no one can say with certainty which species it really represents—"on reste ainsi dans la tradition des auteurs et l'on n'est pas obligé de procéder au bouleversement général de la nomenclature" ('Notes Échinologiques,' i. p. 30).

In the "Siam" Echinoidea, i. p. 38 *, I have maintained that the name *Plesiodiadema*, Pomel, must be used instead of *Dermatodiadema*, A. Agassiz—the former having been established in 1883 † for *Aspidodiadema microtuberculatum*, the latter in 1898 ‡ for the species "having only small secondary tubercles in the ambulacral areas"; no type species is named, but it is evident that also *microtuberculatum* must be included in the genus, and accordingly *Dermatodiadema* becomes a synonym only of *Plesiodiadema*. Now it is true that Pomel was confused in his diagnosis of the two genera *Aspidodiadema* and *Plesiodiadema*, saying of *Aspidodiadema* "ambulacre très étroit, réduit à des simples granules, comme dans *Cidaris*," and of *Plesiodiadema* "ambulacres . . . pourvus d'un rang double de petits tubercles." Under *Aspidodiadema* he names the species *tonsum*, under *Plesiodiadema*, *microtuberculatum*. On account of this confusion in the diagnoses the name *Plesiodiadema* is rejected by Agassiz ('Panamic Deep-sea Echini,' p. 59), Döderlein ('Echinoidea

* "The Danish Expedition to Siam, 1899-1900, Zoological Results, II., Echinoidea I.," Mém. Acad. R. d. Sci. Copenhagen, 7 sér., i. (1904).

† A. Pomel, 'Classification méthodique et genera des Échinides vivants et fossiles,' 1883, p. 106.

‡ "Preliminary Report on the Echini. Reports on the Dredging Operations . . . U.S. Fish Comm. Steamer 'Albatross,' 1891, xxiii., Bull. Mus. Comp. Zool. xxxii. no. 5, 1898, p. 76.

d. deutschen Tiefsee-Exped. p. 157), and by Agassiz and Clark ('Hawaiian and other Pacific Echini, Salenidæ . . . Diadematidæ,' p. 100). I must confess that the fact that Pomel names a species under each of his two genera, which must evidently be regarded as the genotypes, seems to me to outweigh the confusion he has made in the diagnoses. If we had to refuse all those of the older genera which are incorrectly diagnosed, what wonderful results would come about! When a genotype is designated it does not matter very much whether the diagnosis is quite correct or not. The genotype is the main thing, and as in this case it has been named by Pomel, it seems to me that the name *Plesiadiadema* ought to be maintained in spite of the erroneous diagnosis. But, as so much can be said both *pro* and *contra*, the question ought to be decided by the International Council of Nomenclature.

The name *Echinocyamus* has also been very much discussed in late years. Lambert maintains that what is described and figured under this name by Van Phelsum is the high form now universally called *Fibularia*, not the flat form common in European seas now universally known as *Echinocyamus*. Accordingly he wants to have these two names interchanged, and he has, in fact, done this in his later works. In the 'Ingolf' Echinoidea (ii. p. 38) I have discussed the matter at some length, pointing out (1) that Van Phelsum himself indicates that his specimens came from the Adriatic (and America), where no high forms are found; in the Adriatic *Echinocyamus pusillus* alone occurs, being very common there, as is well known*: and (2) that the enlarged figures given by Van Phelsum are quite impossible, resembling neither the low nor the high forms among recent species, while the unenlarged figures in any case resemble much more the flat European species than the high East Indian species. Accordingly I conclude that it is undoubtedly our common *Echinocyamus pusillus* which is the type of Van Phelsum's genus *Echinocyamus*.

To this Lambert objects, in his 'Description des Échinides fossiles des terrains miocéniques de la Sardaigne,' that the localities given by Van Phelsum are incorrect:—"On sait d'ailleurs avec quelle facilité peuvent s'égarer des étiquettes

* In his "Description des Échinides fossiles des Terrains miocéniques de la Sardaigne" (Mém. Soc. Pal. Suisse, xxxiv. 1907, p. 38) Lambert says: "Van Phelsum ne dit d'ailleurs pas comme le voudrait M. Mortensen qu'il y a d'autres *Echinocyamus* dans l'Atlantique et l'Adriatique, il affirme que ces espèces, les types figurés, en proviennent et c'est là sa seule erreur." This must be a misunderstanding of my text. I do not see that I have ascribed the error to Van Phelsum.

volantes. L'erreur commise sur l'habitat des individus figurés est ici d'autant plus évidente que ni Van Phelsum, ni Cramer n'avaient recueillis ces individus eux-mêmes; ils les tenaient de navigateurs et peut-être de seconde ou de troisième main. Chacun sait combien les erreurs de provenances sont faciles dans de pareilles conditions." Lambert must thus have recourse to the contention that there must have been a confounding of the labels in the old collection of Cramer; this sounds, indeed, very convincing! What a pity that this collection no longer exists (as Professor Sluiter has kindly informed me); it would have been very interesting to see whether there were any labels at all in it! Lambert can give no proof whatever that the locality "Adriatic" is wrong. To the other objection, that the unenlarged figures resemble much better the flat form, Lambert only says: "Je ne suivrai évidemment pas le savant professeur dans cette argumentation, où une hypothèse remplace la discussion"! I am not going to discuss this further, as Lambert will evidently not accept any reason on this point. But I do not fear that anybody without preconceived ideas will join Lambert in his view. I will merely quote, *mutatis mutandis*, from Lambert himself the following passage ('Notes Échinologiques,' i. p. 32, note):—"Mais pourquoi de pareils bouleversements sans utilité pratique? Pourquoi, contrairement à une tradition (demi-) séculaire faire d'une forme élevée le type d'un genre que tout le monde a compris autrement? C'est là du byzantinisme, bon à jeter la déconsidération sur les sciences échinologiques et nous ne cesserons de protester contre de semblables propositions, qui violent en réalité les règles sagement entendues, édictées par les Congrès, et très certainement celles autrement respectables de la logique et du bon sens."

As with *Echinocyamus*, so Lambert deals with a number of old familiar names—*Brissopsis*, *Schizaster*, *Spatangus*, *Echinocardium*, *Strongylocentrotus*, *Diadema*; they are either used in quite a new sense or wholly rejected. As I think it hopeless to try to convince Lambert of the absurdity of all these changes, I shall not here enter into a discussion of them*.

In spite of the remarkably modest sentence concluding Lambert and Thierry's 'Notes Échinologiques I.,'—"Ainsi, quelles que soient les divergences d'écoles, nous proposons de mettre pratiquement tout le monde d'accord et cette seule conséquence est pour nous un critérium de l'excellence de nos

* I have included some remarks on these names, excepting *Strongylocentrotus* and *Diadema*, in the 'Ingolf' Echinoidea, ii. pp. 174-176.

conclusions,"—I feel sure that the nomenclature adopted by these authors will never be generally accepted, and that the result will only be most unfortunate confusion. But out of these endless discussions about the correct application of priority rules grows the conviction of the absurdity of maintaining these rules strictly in all cases. To have the excellent and universally adopted name *Archæocidaris* changed into the quite misleading *Echinocrinus*, as it should be according to strict application of the rules, does it not appear ridiculous? But that is a minor matter. Look at Dr. Franz Poche: he is the man to make changes worth speaking of! *Holothuria* is to be the name of a *Salpa*; what have hitherto been called Holothurians by the whole scientific world shall now be called Bohadschioidea. *Actinia*, on the other hand, is a true Holothurian—no, pardon me, I mean a true Bohadschioid (a *Cucumaria*),—whereas what have hitherto been called Actinians by the whole world shall now have the beautiful name Priapidæ. *Salpa* is to be rejected for the name *Dagysa*, and we have in the future to speak of the Dagysids instead of the Salps *. When we have then made *Bipinnaria* a genus of starfish, *Echinus* perhaps an insect, *Nauplius* a crab, *Rana* a fish, *Ciconia* a crane, changed *Palæornis* into *Buteo*, the old *Buteo* into *Craxirex*, made *Cynocephalus* to mean *Galeopithecus*, &c., &c., we will be well off and may be proud of the results of the strict application of the priority rules!

There has recently arisen some opposition to the strict application of the priority rules in all cases which leads to such extremely unfortunate results. At the meeting of the British Association in Dublin in 1908 Mr. G. A. Boulenger † eloquently advocated that "names with which all general zoologists, anatomists, and physiologists are familiar should be respected, should be excepted from the rule in virtue of what may be termed the privilege of prescription," pointing out the intolerable conditions resulting from the transfer of old well-known names to other forms (for instance, *Astacus*, *Torpedo*, *Holothuria*, *Simia*, *Cynocephalus*), as also the difficulties arising from the practice in the use of the previous literature. He proposes that future committees

* Franz Poche, "Über den richtigen Gebrauch der Gattungsnamen *Holothuria* und *Actinia*, nebst einigen anderen grösstenteils dadurch bedingten oder damit in Zusammenhang stehenden Änderungen in der Nomenclatur der Coelenteraten, Echinodermen und Tunicaten," Zool. Anzeiger, xxxii. n. 3-4, 1907, p. 106.

† "On the Abuses resulting from the Strict Application of the Rule of Priority in Zoological Nomenclature, and on the Means of protecting well-established Names," Rep. Brit. Assoc. 1908, p. 735.

should determine, group by group, what names are entitled to respect and should therefore be protected from the attacks of the revisers of nomenclature.

In a recently published paper ("Some common Crinoid Names, and the Fixation of Nomenclature" *) Dr. F. A. Bather comes to the same result, that it will be necessary to protect some of the common and more important names, and suggests that "those zoologists who wish to protect certain names should lay the complete facts of the case before the Nomenclature Committee of the International Zoological Congress, and should accompany their request for the retention of certain definite names in defiance of the Rules by the signatures of as many workers on the group affected as they can obtain. Due announcement of the proposed step should be made in certain widely circulated journals, and a reasonable time should be allowed for the reception of protests. The Committee should ultimately give its decision, and this decision should be published in the aforesaid journals." And further details are given as to the practical arrangement of the matter, about which I may refer to the paper quoted.

It may, lastly, be mentioned that Mr. Frank Springer has recently made a practical trial to secure the name *Encrinus*, sending a circular about the history of that name to a large number of working zoologists and palæontologists, and asking their opinion on the question. The result of this interesting trial has not yet been published.

I myself, in 1907 ('Ingolf' Echinoidea, ii. p. 176), made a proposal similar to that now set forth in a more detailed way by Dr. Bather. I there wrote, in regard chiefly to the names of Echinoids:—"I think there is only one way to get out of this almost insupportable condition of the nomenclature, viz., if all the echinologists of the present time meet to form an international committee, and come to an agreement regarding all the names of Echinoidea, one by one, and then publish a complete list of all the names finally adopted, with their synonyms and complete history." Some still older proposals tending in the same direction as those maintained above are recorded in the papers quoted by Dr. Bather and Mr. Boulenger.

It is evident that there is a fast-growing opinion among zoologists that something should be done in this direction. That I for my part most heartily agree with this need scarcely be said. But I may be permitted to make a few remarks on some phases of the question. It may first be maintained

* Ann. & Mag. Nat. Hist. ser. 8, iv. 1909, p. 37.

that the specialists in the groups in question alone can be regarded as competent authorities. What these agree on should *eo ipso* be accepted by the Committee; the protest of some fanatic "priority ruler" should not weigh against otherwise unanimous wishes from the really competent authorities. In cases of doubt the Committee would, of course, have to decide. Concerning the generic names to be protected, it will be necessary to name the species which should be regarded as the genotype, with references to the best descriptions; species-names will generally be less important to protect, though there may be some cases where it will be very desirable to fix them also. On the other hand, it might be less important to have the whole history of each name worked out before the decision is made. As the decision is to be made against history, I do not see the necessity of that, and it might be left to those who have a special taste for that kind of work; they might then dig up old works, post-Linnæan or pre-Linnæan—even pre-Aristotelian, if such could be found: they would do no harm any more; their work would even be praiseworthy, as it is only just that the merits of the oldest authors should be remembered, and all those who are loth to spend their time on these questions would be freed from that unpleasant work.

I may now proceed to discuss the question about *which Echinoid names should be thus protected*. This, it seems, can be answered at once: it must upon the whole be those used in the 'Revision of the Echini.' From this work, which I would, in spite of my disagreement with the author in several points, term a classical work, dates the whole of the recent Echinoid literature (on the recent Echini), and it will certainly for a very long time remain the basis of the study of the Echinoids. The advantages of having the more important of the names codified in the sense in which they are used in this work, and, indeed, in most of the following literature, are self-evident. I would propose to thus fix the following names:—

<i>Phyllacanthus</i> , Br., with genotype:	<i>imperialis</i> , Lamk. (= <i>dubia</i> , Br.).
<i>Arbacia</i> , Gray	<i>livula</i> , L.
<i>Diadema</i> , Schynv.	<i>saxatile</i> , L.*
<i>Strongylocentrotus</i> , Br.	<i>dröbachiensis</i> , O. F. Müller.
<i>Echinus</i> , Rond. (L.)	<i>esculentus</i> , L.
<i>Echinocyamus</i> , v. Phels.	<i>pusillus</i> , O. F. Müller.

* As there has recently been some dispute concerning the name *saxatile*, it may be pointed out that I mean the species described under this name in the "Siam" Echinoidea, i. p. 9.

<i>Fibularia</i> , Lamk., with genotype :	<i>ovulum</i> , Lamk.
<i>Spatangus</i> , Klein	<i>purpureus</i> , O. F. Müller.
<i>Echinocardium</i> , Gray	<i>cordatum</i> , Penn.
<i>Schizaster</i> , Agass.	<i>canaliferus</i> , Lamk.
<i>Brissopsis</i> , Agass.....	<i>lyriferus</i> , Forbes.

There might perhaps also be reason to fix such names as *Salenia*, *Echinometra*, *Psammuchinus*, *Moiria*, and others, and also *Cidaris* and *Dorocidaris* might be taken into consideration. Nobody, I think, will deny that it would be desirable to keep the name *Dorocidaris*, so much used in literature; *Cidaris* would then naturally get *metularia* as its genotype.

To have fixed *all* the generic names of Echinoidea with their genotypes would, of course, be the best. But if only the above names (and some names of fossil genera ought, perhaps, to be added, as, e. g., *Ananchytes*) were secured, much stability would follow. The end of it should be the making of a complete CODEX NOMINUM, containing all the generic names of the animal kingdom, with their genotypes given.

BIBLIOGRAPHICAL NOTICES.

A Treatise in Zoology. Edited by Sir RAY LANKESTER, K.C.B., M.A., LL.D., F.R.S. London: Adam & Charles Black. 1909.

- (1) Part VII. *Appendiculata*: Third Fascicle. *Crustacea*.
By W. T. CALMAN, D.Sc.
- (2) Part I. *Introduction and Protozoa*: First Fascicle. By S. J. HICKSON, F.R.S., J. J. LISTER, F.R.S., F. W. GAMBLE, D.Sc., F.R.S., A. WILLEY, M.A., D.Sc., F.R.S., H. M. WOODCOCK, D.Sc., the late W. F. R. WELDON, F.R.S., and E. RAY LANKESTER, K.C.B., F.R.S.

THE fact that for more than a generation the standard text-books on Zoology in use in this country have been translations from the German or French has been due, not so much to the lack of competent teachers, as to the generous appreciation which we have always shown of what is good in our neighbours. That this attitude redounds to our credit is undeniable. Furthermore, it argues the conviction that no great benefit to science could accrue from the production of a "home-made" book so long as that book was, like its continental forerunners, the work of a single author; for of necessity it could not pretend to be more than a compilation—though a good compilation needs a wide grasp of facts and wise discrimination. Realizing this, Sir Ray Lankester set himself the task of

expanding what is usually condensed into one or two volumes, the work of a single author, into a series of volumes, each the work of one or of several authors, as circumstances demanded; and to this end he applied himself to the task of selecting his team. The signal success which has crowned his efforts lays us all under a debt of gratitude, and at the same time demonstrates his knowledge of "who's who" in the zoological world.

Dr. Calman's volume on the Crustacea will be welcomed not only by carcinologists, but also by teachers conducting classes of advanced zoology, for no other group of Invertebrates, perhaps, is so well suited to demonstrate the broad principles of morphology. Dr. Calman, himself a teacher of no small experience, has evidently kept this aspect of work always before him, and thus his volume will attain its fullest measure of usefulness.

Having a wide and extensive knowledge of this group, the bulk of what he has written may be regarded as first-hand information, even though much of it may now be common knowledge; but where he had to rely on the work of others he has displayed a wise discrimination.

The pages of this book may be made to yield a helpful guide as to lines of further research, for the author has indicated many matters which need clearing up, some of quite exceptional interest. What, for example, is the nature of the spine in *Argulus*, which is generally regarded as a poison-organ? This spine is provided with a duct communicating with three large groups of unicellular glands lying at its base. Though the secretion of these glands is generally regarded as of a poisonous character, no definite evidence on this head seems to have been adduced. Having regard to the universal absence of ciliary organs in the Crustacea, it is of more than ordinary interest to find in one of the Copepoda—the freshwater Hepacticid *Belisarius*—"a curious vibratile organ . . . connected with, or in close proximity to, the maxillary gland," which is "supposed to be of the nature of a 'flame-cell.'" It is generally supposed that retrogression, once it appears, must be continuous; but the author shows that, in the Crustacea at any rate, this is not only untrue, but, among larvæ, organs which have disappeared may re-develop in later stages, as in the case of the thoracic part of the male larva of *Enterognathus*, one of the Copepoda. The developmental history of this group shows yet other curious phases shared in common with other lowly types belonging to it, in relation to sexual characters.

Finally, we may refer to the supposed occurrence of "hypodermic impregnation" in the Asellotan *Jæra*, wherein it is believed that "a spermatophore is inserted by the male between the thoracic terga of the female, and that it permeates the articular membrane and passes into the body-cavity, discharging its contents into the oviduct, while the empty capsule is expelled by the oviducal aperture." The account of this extraordinary process, Dr. Calman remarks, cannot be accepted without further investigation.

The volume on the Protozoa is the first of the two devoted to this group. The second volume, or second "Fascicle," has already been reviewed in these pages. With the issue of the present volume students have the most complete account of the Protozoa yet published; and this fact now assumes considerable importance, for during recent years the Protozoa have acquired a quite unexpected significance, owing to the discovery of the part they play in the history of man's well-being.

The first part of the Editor's Introduction to the Series occupies the opening pages of the volume now before us—the continuation thereof appearing in the second fascicle,—and this will be read with profit and enjoyment by all who are interested in the problems of the origin of life and the relation between animals and plants. These are still much discussed themes, but there is probably no other living writer who could have summarized the present state of our knowledge of this aspect of these lowly organisms in the same masterly fashion.

The study of the Protozoa is one which presents unusual difficulties, and, moreover, the field is so vast that nowadays no single worker can hope to master its intricate mazes. The fact that the present fascicle is the work of no less than six authors—not including the Editor—is perhaps the best proof of this.

The section on the Hæmoflagellates and allied forms is, from its relation to disease, one of the most important in the book; and this has been written by Dr. H. M. Woodcock, Assistant to the Professor of Protozoology in the University of London. It forms an admirable summary of our knowledge of these organisms, based on a very practical first-hand acquaintance therewith.

Though the Mycetozoa are very properly included in these pages, there are many authorities who still insist on claiming them as plants, and to this subkingdom, indeed, they are officially relegated in the British Museum!

These volumes, like those of the series which have already appeared, are admirably illustrated, every figure having a definite lesson, which is by no means the case with most other treatises.

Hull Museum Publications.—No. 63. *A Descriptive Catalogue of the Dobrée Collection of European Noctuæ.* Compiled by HORACE B. BROWNE, M.A., Assistant Master at Hymers College, Hull. 8vo. Hull, 1909. Pp. xv, 156. Price 1s. net.

THE name of Nicholas Frank Dobrée was well known to British entomologists, and we are glad to welcome this carefully prepared Catalogue of his valuable collection of Palæarctic Noctuæ, now in the Hull Museum. The work commences with a short memoir and an account of the collection and of Mr. Dobrée's work; his portrait forms a frontispiece. In the Catalogue the history of each specimen is fully recorded and every aberration or variety is described. In the Appendices we find lists of Mr. Dobrée's correspondents; a list

of his published papers (twenty-four in number), special attention being called to a paper on Melanism in the 'Entomologist' for 1887; and a list of works of reference in the Central Public Library, Hull. The volume concludes with a complete Alphabetical Index of Species.

We have only one fault to find with the execution of this excellent little book. Too much prominence is given to the term "European" collection, for, as we are told on p. x, "The collection . . . consists of a magnificent series of specimens obtained from almost every district of the entire Palæarctic Region from Iceland to Vladivostock."

PROCEEDINGS OF LEARNED SOCIETIES.

GEOLOGICAL SOCIETY.

November 3rd, 1909.—Prof. W. J. Sollas, LL.D., Sc.D., F.R.S., President, in the Chair.

The following communications were read :—

1. 'Certain Jurassic (Lias-Oolite) Strata of South Dorset, and their Correlation.' By S. S. Buckman, F.G.S.

(1) Descriptions are given of certain strata (Lower Bathonian to Pliensbachian) on the Dorset coast :—Chideock and Burton Bradstock.

(2) Comparison is made with similar strata inland—with a summary of beds at Stoke Knap; with certain North Dorset strata; with Toarcian beds of Yorkshire and Northamptonshire.

(3) The strata described are classified according to what may be called the 'multizonal' or 'polyhemeral' system in the main, according to the scheme introduced for these strata in 1893 (5); but further divisions due to other investigators and to the Author are dealt with.

(4) The strata described are arranged among thirty-six zonal (hemeral) divisions—a greater number of divisions than Oppel used in 1856 for all the Jurassic rocks, of which these beds form but a small part.

(5) The Upper Lias part of the Junction-Bed of Down Cliffs, Chideock (Lower or pre-*striatulus* Toarcian) is a very condensed, imperfect epitome in 20 inches of about 80 feet of strata on the Yorkshire coast, and of very much more, allowing for gaps.

(6) Between the *bifrons*-layer and the *striatulus*-layer of the Junction-Bed there is occasionally a 2-inch layer which is all that represents some 250 feet of deposit in the Cotteswolds—so that about 2 feet of Junction-Bed was formed while some 550 feet were being deposited elsewhere.

(7) The Upper Toarcian (*moorei-dumortieriæ* hemeræ) makes a great showing at Burton Bradstock and Down Cliffs as the Down Cliffs Clay and Bridport Sands (*pars*)—the greatest thickness of rocks of these dates in the country.

(8) The sequence of *aalensis*-strata above *moorei*-beds is demonstrated at Chideock Quarry Hill, in the upper part of the Bridport Sands.

(9) The Inferior Oolite (Aalenian, Bajocian, Bathonian *pars*) strata of Burton and Chideock are not counterparts of one another: they supplement each other to a certain extent; both are incomplete, and much epitomized representatives of thicker deposits elsewhere.

(10) Mr. Thompson's zonal scheme for the Upper Lias is considered, and a table of Upper Lias zones for future work is presented.

2. 'Certain Jurassic ("Inferior Oolite") Ammonites and Brachiopoda.' By S. S. Buckman, F.G.S.

This paper is presented as a palæontological appendix, partly to the Author's accompanying communication, partly to his previous stratigraphical work. In a short introduction the Author, remarking on the fecundity of the 'Inferior Oolite' in the matter of species, makes the suggestion that this is due to the relatively great length of time taken up in its deposition; and he adduces data for supposing that the time thus occupied was from one-fifth to one-fourth of that for the whole Jurassic System.

The paper describes certain species of Ammonites and Brachiopoda which are important for the identification, the correlation, or the dating of Inferior Oolite deposits, and certain other notable species which, having frequently attracted attention in the field, require naming in the interest of future workers.

3. 'The Cretaceous and Eocene Strata of Egypt.' By William Fraser Hume, D.Sc., A.R.S.M., F.G.S., Superintendent, Geological Survey of Egypt.

The Author divides the fossiliferous Cretaceous strata into three series:—

1. A northern Antonian type, marked by Cenomanian species, including typical Turonian strata.

2. A central Egyptian or Hammama type, Cenomanian strata being absent, Campanian marked by abundance of *Ostrea villei* and *Trigonarca multidentata*, and phosphatic beds; the Danian portion having an eastern facies in which *Pecten*-marls are a characteristic feature, and a western chalky limestone indicating a close affinity with the white chalk of Northern Europe.

3. A southern or Dungul type, having close affinities with 2, but in the Campanian the phosphatic beds are inconspicuous, and the

fauna consists of a group of specialized sea-urchins and of gastropods among which *Turritellæ* are very prominent.

The Author emphasizes the uniformity of the Lower Eocene throughout Egypt, its triple subdivision being recognizable over vast areas. In the Middle Eocene this uniformity is replaced by differentiation, the well-known regions of the Fayûm and the Moqattam Hill differing from the succession in the area selected as typical in this paper. In the latter, five zones have been recognized in the lower division, while in the Upper Moqattam the *Turritella*-beds and the strata rich in *Carolia placunoides* and *Plicatula polymorpha* are of zonal importance. The Lower Moqattam is considered as beginning with the *Nummulites-gizehensis* zone and closing with the *Gistortia*-bed, to the significance and extent of which attention is especially directed.

The Author discusses the relation between the Cretaceous and Eocene beds, and points out that they differ lithologically, limestones being dominant in the Lower Eocene and shales in the Upper Cretaceous.

Palæontologically, great groups such as the Ammonites still abundant in the Upper Cretaceous disappear in the Eocene and are replaced by the characteristic nummulinid foraminifera. On the other hand, both periods bear a strong resemblance to each other in the dominance of oysters and sea-urchins over other forms. A notable feature is the comparative rarity of brachiopoda in Egypt throughout both periods, nor have belemnites been recorded from the Egyptian Cretaceous.

Among post-Eocene formations the calcareous grits are shown to have a wide extension; but in the Desert they differ in character from the mammal-yielding beds of the Fayûm. The question as to the Upper Eocene or Oligocene age of these beds is left over.

The quartz-chert gravels appear to be closely related to the calcareous grits, but are unconformable upon them. This continental phase is accompanied by volcanic and geyser activity.

The Cretaceous Period in Egypt was therefore one, in the main, marked by the gain of sea over land, the Eocene was one of rest, while at the close of the Eocene and during the Oligocene the approach of a continental phase is clearly indicated.

MISCELLANEOUS.

RICHARD BOWDLER SHARPE, LL.D.

DR. RICHARD BOWDLER SHARPE, the eminent ornithologist, died on Christmas Day at his residence in Chiswick. Dr. Sharpe was born in London on November 22nd, 1847, and was educated at Brighton, and at Peterborough and Loughborough Grammar Schools. Even as a boy he was an enthusiastic naturalist, and in his holidays at Cookham made a collection of Birds, which he

afterwards presented to the British Museum. He came to London in 1863, and served with Messrs. W. H. Smith and then with Bernard Quaritch, leaving the latter in 1867 to take the post of Librarian to the Zoological Society, which he held until 1872. During this period every hour which he could get for himself was spent in the study of Birds and in making a private collection of them.

The 'Monograph of the Alcedinidæ (Kingfishers),' published in parts from 1868 to 1871, was a remarkable work to have been accomplished by so young a man under such conditions. In the preface he asked for some slight consideration "for an author who commences so large an undertaking at the age of seventeen, and who as he pens these last words has not attained to the age of twenty-three." This was unnecessary, for the Monograph at once established his reputation, and still remains a model which any who project a monographic work may study with advantage. The introductory chapters dealt with the relationship of the various genera and species, their geographical distribution, &c., with a chronological account of the literature. Then came a description of the anatomy of the Kingfishers, written by Dr. Murie; followed by the systematic part, including full and careful descriptions of each species, their habits and distribution, illustrated with 120 coloured plates.

A 'History of the Birds of Europe' had now been commenced with Mr. H. E. Dresser, and the first parts appeared in 1871; but in the following year Dr. Sharpe was appointed a Senior Assistant in the British Museum, and left the completion of this work to his collaborator, in order to devote himself to the task of building up the national collection of Birds and writing a catalogue.

How he succeeded is well known; the collection increased in number from about 30,000 to more than 400,000 specimens, and this stupendous result was chiefly due to the personal qualities of Dr. Sharpe himself. He started by presenting his own private collection, he spent his vacations in collecting, and with his own money he purchased *desiderata*, rather than allow the museum to lose them. Moreover, he infected with his own enthusiasm most of those with whom he came in contact, visitors to the museum, travellers, collectors, and others; and in consequence, as he has often told the present writer, he never missed a collection that he wanted.

The 'Catalogue of Birds' took 24 years to finish, and ran to 27 volumes, 13 of which were written by Dr. Sharpe without collaboration; of these it may truly be said that they are the most complete works of the kind that have ever been written; in fact, the keynote of Dr. Sharpe's work was thoroughness.

The Catalogue was supplemented by a 'Nomenclator Avium, or Hand-list of Birds,' in five volumes, the first of which was published in 1899, whilst the last has only recently been issued.

One of the most attractive features of the exhibition galleries of the British Museum (Natural History) is the series of British Birds

and their nests, mounted so as to represent the actual surroundings; this was initiated by Dr. Sharpe, who procured the first of these natural groups, that of the Coots, at Avington Park, in Hampshire.

Dr. Sharpe was promoted to the rank of Assistant-Keeper in 1895; he was the author of numerous books and memoirs in addition to those already mentioned, a successful and popular lecturer, and an honorary member of many scientific societies both at home and abroad. He was elected *Officier de l'Instruction Publique* in 1901, and amongst the distinctions he gained were the degree of LL.D. from the University of Aberdeen in 1891, the gold medal for science awarded him in the same year by the Emperor of Austria, and the presidency of the Fourth International Ornithological Congress in 1905, honours the more prized as they were won entirely by merit and hard work.

He will be mourned by naturalists throughout the world, by thousands who have derived instruction and entertainment from his lectures and his popular books, and especially by the colleagues who will miss his friendly help and genial presence; but the national collection of Birds will remain as a magnificent record of a life of devoted and unceasing activity.

C. T. R.

On the Dates of Publication of Costa's 'Fauna del Regno di Napoli,' 1829-1886.

THIS work, begun by O. G. Costa in 1829 and continued after his death by his son Achille Costa, was issued in fasciculi of varying amounts of text. A single leaf of brownish-yellow paper bearing a rough collation of the subjects that had appeared up to the end of 1875 was issued by Gustav Lange. This collation refers to 117 fascicules, but their contents are not given, and no reference is made to any dates.

The dates, however, are not so puzzling as appears at first sight, owing to a singular method of dating by the printer, which, as the only means of information now available, may be accepted as very close to the truth. These printed dates will be found on the back fold or near the back fold of the sheet or half-sheet or single leaf, for each appeared as necessitated by the amount of matter in the printer's hands. Sometimes, if the sheet is not folded truly, the date can be seen by widely opening the bound volume, but frequently the sheet is folded truly and the date has perished under the binder's glue!

As the full list of dates runs to twelve closely written foolscap pages of MS., I do not propose to ask you to do more than to note that this MS. of mine is available for reference at the British Museum (Nat. Hist.) to any one who is desirous of ascertaining any particular date. It may be well to mention that I have not been able to find that the printer so dated any part of the Lepidoptera except the "Geometri, Bombicoidi, and Cœliopodi."

C. DAVIES SHERBORN
(*'Index Animalium'*).

Nov. 25, 1909.

THE LONDON, EDINBURGH, AND DUBLIN

PHILOSOPHICAL MAGAZINE

AND

JOURNAL OF SCIENCE.

A JOURNAL DEVOTED TO PHYSICS, ASTRONOMY, MECHANICS,
CHEMISTRY, MINERALOGY, AND THE ALLIED SCIENCES.

MONTHLY, PRICE 2s. 6d.

Complete sets (unbound) may be obtained. Prices on application.

The *First Series*, in 68 volumes, from 1798 to 1826. A few imperfect copies only on hand.

The *Second Series*, in 11 volumes, from 1827 to 1832.

The *Third Series*, in 37 volumes, from 1832 to 1850.

The *Fourth Series*, in 50 volumes, from 1851 to 1875.

The *Fifth Series*, in 50 volumes, from 1876 to 1900.

TAYLOR and FRANCIS, Red Lion Court, Fleet Street.

THE ANNALS AND MAGAZINE

OF

NATURAL HISTORY,

INCLUDING

ZOOLOGY, BOTANY, AND GEOLOGY.

MONTHLY, PRICE 2s. 6d.

Complete sets (unbound) may be obtained at the following prices:—

The <i>First Series</i> , in 20 volumes, from 1838 to 1847.	Price £10.
The <i>Second Series</i> , in 20 volumes, from 1848 to 1857.	„ £10.
The <i>Third Series</i> , in 20 volumes, from 1858 to 1867.	„ £12.
The <i>Fourth Series</i> , in 20 volumes, from 1868 to 1877.	„ £12.
The <i>Fifth Series</i> , in 20 volumes, from 1878 to 1887.	„ £12.
The <i>Sixth Series</i> , in 20 volumes, from 1888 to 1897.	„ £12.

TAYLOR and FRANCIS, Red Lion Court, Fleet Street.

THE FAUNA OF BRITISH INDIA, INCLUDING CEYLON AND BURMA.

Published under the authority of the Secretary of State for India in Council.

Edited by A. E. SHIPLEY, M.A., F.R.S.

Med. 8vo, with text illustrations and 10 plates. Price 10s.

DERMAPTERA (EARWIGS). By Dr. MALCOLM BURR, M.A., F.L.S.

TAYLOR and FRANCIS, Red Lion Court, Fleet Street, E.C.

BIOLOGIA CENTRALI-AMERICANA.

Edited by F. DUCANE GODMAN.

SUBJECTS IN PROGRESS.

ZOOLOGY.

Chilopoda and Diplopoda. By R. I. Pocock. (Pp. 1-152, pls. i.-xi.)
Coleoptera. Vol. IV. part 3 (RHYNCHOPHORA: Curculionidæ). By D. SHARP. (Pp. 1-168, pls. i.-vi.)
Coleoptera. Vol. IV. part 7 (RHYNCHOPHORA: Curculionidæ, *continued*). By G. C. CHAMPION. (Pp. 1-48, pls. i., ii.)

The Price of each Part is 21s.

London: Published for the Editor by DULAU & Co., Soho Sq., W.

LAND AND FRESHWATER MOLLUSCA OF INDIA.

Part X. Vol. II. Price 21s.

By Lieut.-Col. H. H. GODWIN-AUSTEN, F.R.S.

With 17 Plates and Text, treating of the following Genera and Sub-Genera, with anatomical details:

Macrochlamys, Bensonia, Austenia, Taphrospira, Sophina, Euplecta, Kaliella, Durgella, Leptodontarion, Lamprocystis, Corilla, Plectopylis, Thysanota, Philalanka, and Sykesia; and the following new Genera: Dalingia, Sarika, Rahula, and Staffordia.

TAYLOR and FRANCIS, Red Lion Court, Fleet Street, E.C.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[EIGHTH SERIES.]

No. 26. FEBRUARY 1910.

XVII.—*Descriptions and Records of Bees.*—XXV.
By T. D. A. COCKERELL, University of Colorado.

Table of the Australian Species of Prosopis.

THE following table was prepared at the British Museum, with the types of nearly all the species before me. The genus is here interpreted in the old broad sense; some of the species belong to *Palæorhiza*, Perkins, which, though in most respects Prosopiform, is distinct by the elongated and pointed tongue. The type of this genus is *Palæorhiza perviridis* (*Prosopis perviridis*, Ckll.). I have included in the table also one or two species of the Austro-Malay region.

The only species not before me at the time of preparing the table were *P. bidentata*, Sm., *P. fulvicornis*, Sm., *P. lubbocki*, Ckll., *P. liogonia*, Vachal, *P. quadrata*, Sm., and *P. vicina*, Sichel.

Abdomen red or red and black, not metallic (obscurely reddish also in *P. primulipicta*, Ckll., *P. ruficeps*, Sm., and *P. rotundiceps*, Sm.) 1.

Abdomen neither wholly nor in part red (obscurely reddish in the three species just cited; head red in *ruficeps*) 10.

1. Scutellum and postscutellum partly or wholly yellow or cream-colour 2.

- Scutellum and postscutellum dark. 5.
 Scutellum and mesothorax red, but postscutellum black; sides of metathorax red; clypeus red; narrow lateral face-marks pale yellowish *lateralis*, Sm., ♀.
2. Postscutellum cream-colour; scutellum black, with hind margin narrowly cream-colour; head and nearly all of mesothorax red; no light face-marks. (Queensland.) *torrida*, Sm.
- Scutellum and postscutellum, so far as coloured, deep chrome-yellow 3.
 3. Head and nearly all of mesothorax red; no pale face-marks. (Swan R., W. Australia.) *rubricata*, Sm.
- Face with bright yellow markings 4.
 4. Larger; a black stripe down each side of clypeus; red of abdomen obscure *elegans*, Sm., ♀.
 Smaller; face bright yellow right across. *elegans*, Sm., ♂ (*sydney-ana*, Ckll.).
5. Axillæ ferruginous; mesothorax dull reddish, with two broad suffused black bands; abdomen with only first segment and extreme base of second red; legs clear red; face deep orange *bicolorata*, Sm.
- Mesothorax red; abdomen with first two segments red; clypeus red; narrow lateral marks pale yellowish. *proxima*, Sm.
- Mesothorax black. 6.
 6. Red of abdomen very obscure, but basal middle of first segment orange; clypeus black, with lower margin broadly ferruginous; broad cuneiform creamy-white lateral face-marks, having a short linear process above along orbits. (Swan R.) *albomaculata*, Sm.
- Abdomen at least partly bright ferruginous 7.
 7. Apical half of abdomen dusky or black. 8.
 Abdomen entirely red 9.
8. Larger; metathorax rough, with no defined area; clypeus black, with lower margin dull red; lateral face-marks creamy white, small and short. *rufipes*, Sm.
 Smaller; area of metathorax well defined; clypeus white, with a black mark on each side
9. No supraclypeal mark *constricta*, Ckll.
 Supraclypeal mark well developed. *subplebeia*, Ckll.
coronata, Ckll.
10. Metallic, green or blue, species (*P. rotundiceps* ♀ and others are faintly metallic on abdomen) 11.
 Black species, not metallic (abdomen obscurely metallic in *P. rotundiceps* ♀, *P. metallica*, *P. similima* ♂, and *P. honesta*). 32.
11. Head and thorax black except for the

- light markings; metallic colour of abdomen obscure in some 12.
- Head and thorax metallic 21.
- Head red; thorax black; clypeus red; broad lateral marks chrome-yellow (allied to *purpurata*, and, like it, having not only the tubercles yellow, but also a spot just behind them on the pleura; both are from Adelaide, and may be sexes of one species) *ruficeps*, Sm.
12. Scutellum and postscutellum black; size large 13.
- Scutellum and postscutellum at least largely bright yellow or orange 14.
13. Clypeus bright yellow, bordered with black at sides *alcyonea*, Erichs., ♂
- Clypeus black, with a median yellow band [*vidua*, Sm.).
- (Here also runs *liogonia*, Vachal, but it is smaller, only 7 mm. long.) *alcyonea*, Erichs., ♀.
14. Clypeus yellow (in this section comes *P. vicina*, Sichel, which is, however, almost certainly based on a mixture of species; the name should be restricted to the New-Zealand specimens) 15.
- Clypeus black; broad lateral face-marks present 18.
15. No supraclypeal mark; abdomen strongly punctured, its metallic colour very obscure *metallica*, Sm.
- (*P. lubbocki*, Ckll., which was described by Smith as the male of *metallica*, is shining nigro-aeous, with clypeus, supraclypeal mark, lateral marks, and scape in front cream-colour.)
- Supraclypeal mark present 16.
16. Scape yellow beneath; insect much smaller than *metallica* *purpurata*, Sm.
- Scape all black; males 17.
17. First r. n. entering second s.m.; supraclypeal mark rounded above *violacea*, Sm.
- First r. n. joining first t.-c.; supraclypeal mark broadly truncate above *cognata*, Sm.
18. Large, length about 12 mm., aspect of *alcyonea*; abdomen dark greenish *perplexa*, Sm. (*confusa*, [Sm.).
- Much smaller; no yellow spot behind tubercles 19.
19. Lateral face-marks bow-shaped; clypeus sparsely punctured; mesothorax finely punctured; two species very much alike 20.
- Lateral face-marks cuneate, deep orange; clypeus with dense punctiferous grooves; mesothorax with very large coarse dense punctures. (Kuranda.). *amata*, Ckll.
20. Larger; clypeus with a slight median raised line; face-marks pale red, but evidently originally yellow; first r. n. entering second s.m. (Swan R.) *violacea*, Sm., ♀.

- Smaller; clypeus with no raised line; lateral face-marks very bright chrome-yellow; first r. n. joining first t.-c. (W. Australia.) *cognata*, Sm., ♀.
21. Scutellum and postscutellum bright chrome-yellow; mesothorax brilliant green; a yellow spot on pleura behind tubercles; species of *Palæorhiza* 22.
- Scutellum and postscutellum each with a lateral pale stripe or patch; head and thorax dark green; abdomen purple, with green shades. (Kuranda.) *permiranda*, Ckll.
- Scutellum and postscutellum without light markings. 23.
22. Clypeus yellow. (Kuranda, *Dodd.*).... *parallela*, Ckll., ♂.
Clypeus green, with a light median stripe. *parallela*, Ckll., ♀.
23. Tubercles without any light colour; large or rather large species (probably all *Palæorhiza*) 24.
- Tubercles with at least a light spot 26.
24. Mesothorax blue; face marked as in *P. perviridis* *reginarum*, Ckll.
- Mesothorax green. 25.
25. Face with three yellow stripes; abdomen bright green *perviridis*, Ckll.
- Median stripe reduced to a spot on lower part of clypeus; abdomen with strong purple tints. (Dory, New Guinea.).. *imperialis*, Sm.
- Median stripe wholly wanting; abdomen dark green *varicolor*, Sm.
26. Face without light marks; very small blue species *baudinensis*, Ckll.
- Face with light marks. 27.
27. Clypeus wholly dark, no supraclypeal mark; small species, with fine blue abdomen *albonitens*, Ckll., ♀.
(*P. fijiensis*, Ckll., from Fiji, will run here, but it is a large species, 14½ mm. long; it is brilliant steel-blue, with yellow lateral face-marks.)
- Clypeus light or not wholly dark (if nearly all dark, species not small) 28.
28. Very small species, with white face and large broad supraclypeal mark *albonitens*, Ckll., ♂.
- Medium-sized or rather large species .. 29.
29. Mesothorax irregularly punctured, the punctures not of the same size; lateral face-marks (very pale yellowish) broad, their inner side strongly arched; abdomen blue *disjuncta*, Ckll.
- Mesothorax densely, strongly, and evenly punctured. 30.
30. Green species, larger than *disjuncta*; lateral face-marks narrower than in *disjuncta*, their inner side not arched; abdomen green, first two segments strongly punctured *varicolor*, Sm., ♂.

(♀ *varicolor* may have a minute light clypeal spot, and so come in here. Male *varicolor* obtained by Dodd at Townsville show variation; the axillæ may be cream-colour and second abdominal segment purple, and the clypeus may be all light except the sutures.)

- Blue species; first two abdominal segments sparsely punctured 31.
31. Face light, no black band between clypeus and lateral marks; supra-clypeal mark present *turneriana*, Ckll.
- A metallic purplish dark band at each side of clypeus; second abdominal segment more sparsely and feebly punctured *turneriana kurandensis*, [Ckll.]
32. Scutellum and postscutellum wholly black; size small or medium. 33.
- Scutellum and postscutellum at least partly light 38.
33. Prothorax, except tubercles, black; head seen from in front round 34.
- Prothorax with upper border at least largely pale 35.
34. Face black, with a pair of short quadrate chrome-yellow lateral marks. *quadriceps*, Sm.
- Clypeus, supraclypeal mark, and lateral marks deep yellow *hobartiana*, Ckll. (♀ ♂ of
35. Males; the face yellow right across ... 36. [*quadriceps*].
- Clypeus black, with a large cream-coloured spot. (Celebes.) *insularis*, Sm.
- Clypeus wholly black; light markings deep chrome-yellow 37.
36. Very small, slender; face lemon-yellow. *primulipicta*, Ckll.
- Size medium, robust; face deep chrome-yellow; abdomen with large processes, one on each side, beneath *bituberculata*, Sm.
37. Larger; punctures of mesothorax very distinct *amiculiformis*, Ckll.
- Smaller; punctures of mesothorax so small as to be hardly visible separately under a lens *amicula*, Sm.
38. Postscutellum wholly black, or (*percrassa*) with a very small elongate mark. 39.
- Postscutellum at least largely light (in every case the colour of it and the scutellum is deep chrome-yellow). 42.
39. Very large robust species, of the build of *alcyonea* 40.
- Species of ordinary form, not very large. 41.
40. Clypeus with a median creamy-white stripe *penetrata*, Sm.
- Clypeus wholly dark *penetrata percrassa*, Ckll.
- (*P. percrassa* was described as a distinct species, but a specimen collected by Dodd in Queensland is clearly intermediate, having the clypeus with the upper part of the white mark only, and no light colour on postscutellum.)

41. Clypeus black, lateral face-marks very broad, deep chrome; mesothorax dull, sparsely punctured, the punctures of different sizes *cyanura*, Kirby, ♀.
 (This is *cyanura*, as determined in British Museum, but the abdomen is black, whereas original description says it is "*atrocærulescens*," as the specific name would suggest.)
 Face lemon-yellow, but yellow of scutellum and tubercles deep chrome; mesothorax densely and minutely punctured. (Chowder, 1893: *Froggatt*).. *frederici*, Ckll., ♂, var.
 (This insect was placed as *rotundiceps*, but type *rotundiceps* is a ♀ and has the abdomen minutely and closely punctured, but the mesothorax with coarse large punctures. The Froggatt insect, by the puncturation of mesothorax, cannot be the species ascribed to *cyanura*. Further search discovered the female, also from Chowder: this agrees essentially in face-marks with the "*cyanura*," but the mesothorax is punctured as in ♂. The postscutellum is all black and the area of metathorax dull. Both sexes have the prothorax black, except the bright yellow tubercles; no yellow mark on pleura behind tubercles. In sculpture of thorax the Chowder insect agrees with *frederici*, and I am sure it is a variety of that species.)
42. Face entirely black 43.
 Face with light markings 44.
43. Tubercles yellow, and also a contiguous large yellow patch on pleura; front dull and densely punctured; mesothorax quite densely punctured; area of metathorax not ridged (it is also not ridged in *morosa*) *nigrifrons*, Sm.
 Tubercles black, but a quadrate yellow patch behind; front shining, with well-separated punctures *diversipuncta*, Ckll.
44. No lateral face-marks whatever, but a large light area on clypeus, and a supraclypeal mark; large species 45.
 With lateral face-marks 46.
45. Second abdominal segment finely and quite closely punctured; light area on clypeus very broad (the whole width of clypeus) above, and ending abruptly below a little before the clypeal margin; supraclypeal mark hat-shaped .. *morosa*, Sm.
 Second abdominal segment shining and strongly but sparsely punctured; light area on clypeus a broad parallel-sided band; supraclypeal mark approximately semicircular. (Sydney, N.S.W.: *Froggatt*.) *desponsa*, Sm.
46. Face deeply sulcate on each side 47.
 Face not sulcate; all medium-sized species, looking very much alike 48.
47. Very large species, of build of *alcyonea*; area of metathorax shining and impunctate; lateral marks linear, not

approaching clypeal mark, which occupies most of clypeus, but is deeply constricted on each side; a triangular supraclypeal mark; all these markings deep chrome-yellow, as also a patch on pleura behind tubercles

impressifrons, Sm.

Medium-sized species, superficially like *rotundiceps*; face-marks white, though those of thorax are bright chrome-yellow; lateral marks reduced to a dot on each side near level of middle of clypeus, and a large round spot (caudate below) on each side of antennæ; clypeal patch large. (One hind leg of type carries the pollen-body of an Asclepiadaceous plant.)

sulcifrons, Sm.

48. Lateral face-marks linear; clypeus with a small elongate mark; face narrow; tubercles orange-yellow, but no yellow spot behind them.

nubilosa, Sm.

Lateral face-marks consisting of large round orange-yellow spots, the lower part of the usual marks being absent; clypeus black; tubercles orange-yellow, but no yellow spot behind them; abdomen faintly metallic

rotundiceps, Sm., ♀.

(For *rotundiceps* ♂, see Cockerell, Bull. Amer. Mus. Nat. Hist. xxiii. p. 235.)

Lateral face-marks ordinary 49.

49. Males 50.

Females; clypeus black 53.

50. Clypeus and lateral marks ivory colour; face very narrow. (Kuranda, Dodd.)

aureomaculata, Ckll.

Clypeus yellow 51.

51. Supraclypeal mark present; mesothorax minutely and densely punctured; anterior tibiæ and tarsi red; a constriction between first and second dorsal abdominal segments

elongata, Sm.

(Another specimen is erroneously labelled *similis* ♂.)

No supraclypeal mark 52.

52. Lateral face-marks angular above, the point away from orbital margin; yellow on scutellum and postscutellum reduced; abdomen slightly purplish. (Tasmania.)

honesta, Sm.

Lateral face-marks ending above in an acute angle on orbital margin, above level of antennæ; yellow of scutellum and postscutellum not reduced; abdomen quite distinctly bluish, with hind margins of segments reddish purple. (New South Wales.)

simillima, Sm., ♂.

Lateral face-marks rounded above, ending in an angle on orbital margin, but much more obtusely than in *simillima*.

metallica, Sm.

53. Lateral face-marks ending above in an acute angle on orbital margin, above level of antennæ *simillima*, Sm., ♀.
 Lateral face-marks not ending above abruptly and not above level of antennæ, the marks cuneiform 54.
 54. Punctures of mesothorax large, lateral face-marks very broad. (Swan R.) .. *obtusata*, Sm.
 Punctures of mesothorax very minute .. *frederici*, Ckll. (*similis*, [Sm., preocc.).

XVIII.—*Some undescribed Gerrinæ.*

By W. L. DISTANT.

THE following aquatic Hydrometridæ, belonging to the subfamily Gerrinæ, are all from the waters and adjacent seas of British India. They represent the collections recently made by Dr. Annandale, who has paid so much attention to the fauna of the brackish and fresh waters of India, and also the oceanic species collected by the Indian Marine Survey. The new genera will be figured in the next and concluding volume of the Rhynchota of British India.

Family Hydrometridæ.

Subfam. GERRINÆ.

Div. GERRINARIA.

Gerris lepcha, sp. n.

Body above and beneath black, beneath finely and more palely tomentose; antennæ with the first, second, and third joints brownish ochraceous, extreme apices of the first and second, apical half of the third and the whole of the fourth joint black or piceous, the fourth palely sericeous; anterior area of pronotum with a more or less distinct central longitudinal ochraceous fascia, remaining area piceous brown; legs and rostrum brownish ochraceous, apex of rostrum black; coxæ and trochanters brownish ochraceous beneath; antennæ with the first joint longest, second shortest, third and fourth almost subequal in length or fourth slightly longer than third; head moderately convex, longer than broad; pronotum with the anterior area or lobe with two small transverse linear callosities on disk; posterior area or lobe rugulose and punctate, slightly transversely ridged between the humeral

angles, which are tuberculously prominent, thence convexly deflected to base, the basal margin broadly laminate and strongly punctate; hemelytra longer than posterior femora; rostrum scarcely passing the anterior coxæ; intermediate a little longer than posterior femora.

Length $11\frac{1}{2}$ to 14 mm.

Hab. Sikhim; Shamdang, about 3000 ft. (Ind. Mus.).

Gerris monticola, sp. n.

Head and pronotum dull chocolate-brown, head moderately infusate; pronotum with a central longitudinal dull ochraceous line which is faint and subobsolete on posterior area, anterior lateral and posterior margins dull ochraceous; eyes black; antennæ with the first and second joints brownish ochraceous, their apices black, third and fourth joints piceous; hemelytra piceous brown, the veins brownish ochraceous, a dull greyish elongate spot behind middle and near inner margin, membranous area dull piceous, the extreme margin brownish; body beneath ochraceous; a lateral marginal fascia to sternum, a sublateral slightly curved line scarcely reaching middle of sternum, a longitudinal oblique line at the region of the anterior and intermediate acetabulæ, and suffusions to the abdomen beneath, black; between the lateral and sublateral fasciæ the sternum is silvery grey pubescent, and the lateral margins of the abdomen and a spot on the posterior acetabula also silvery grey pubescent; rostrum ochraceous, its apex black; legs dull ochraceous, the femora narrowly margined with piceous, apices of tibiæ and the whole of the tarsi piceous black; antennæ with the first joint longest, second, third, and fourth joints almost subequal in length; rostrum distinctly passing the anterior coxæ; head moderately convex, longer than broad; pronotum with the margins of the anterior area convex, obscurely transversely ridged between the humeral angles, which are subprominently nodulose, posteriorly moderately obliquely deflected; hemelytra slightly shorter than posterior femora; intermediate and posterior femora about equally long, anterior femora moderately thickened.

This description is taken from a macropterous female specimen; in some apterous male specimens the anterior femora are distinctly incrassated.

Length ♀ macropt. 10, ♀ apt. $8\frac{1}{2}$, ♂ apt. 8 mm.

Hab. Simla Hills; Dharampur, 5000 ft., Matiana 8000 ft. (Annandale); Bhim Tal, Kumaon, 4500 ft. (Annandale); Kurseong, 5000 ft. (Annandale).

Gerris nepalensis, sp. n.

Body above and hemelytra black ; body beneath silvery pubescent; lateral margins of head silvery pubescent; antennæ with the first and second joints castaneous brown, their extreme apices and the whole of the third and fourth joints piceous black ; pronotum with an obscure longitudinal, central, brownish ochraceous line, usually only discernible on the anterior area ; anterior femora black with silvery pubescence, their base and a spot near apex ochraceous ; intermediate and posterior femora brownish ochraceous, their apices black ; intermediate and posterior tibiæ and all the tarsi black, anterior tibiæ brownish ochraceous, their apices black ; antennæ with the first joint longest, fourth slightly longer than third ; head moderately convex, longer than broad ; pronotum with the margins of the anterior area slightly convex, a little transversely ridged between the humeral angles, which are slightly prominent and then globosely posteriorly deflected, the posterior margin sublunate, the posterior area sparsely coarsely punctate ; hemelytra about as long as the posterior femora ; intermediate and posterior femora about equally long ; rostrum black, slightly passing the anterior coxæ.

Length ♂ macropt. 8 mm.

Hab. Nepal ; Soondrijal and Chonebal ; Katmandu ; Lucknow (*Annandale*).

Allied to *G. sahlbergi*, Dist.

Gerris raja, sp. n.

Head ochraceous, eyes black ; antennæ with the first joint ochraceous, its apex black, remaining joints black or piceous ; pronotum with two anterior and two large discal spots ochraceous (in some specimens these spots are united in pairs) ; hemelytra black ; body beneath, rostrum and anterior femora ochraceous ; apex of rostrum and linear streaks to the anterior femora black ; tibiæ, tarsi, and intermediate and posterior femora piceous or black ; antennæ with the first joint a little longer than second, which is shortest, third longest, fourth shorter than third but longer than first ; head a little convex, longer than broad ; pronotum with the humeral angles not prominent ; hemelytra about as long as the posterior femora ; intermediate and posterior femora subequal in length ; rostrum passing the anterior coxæ.

Length 5 mm.

Hab. Travancore Coast ; Vurkalay (*Annandale*).

"In small pools near sea-shore" (*N. Annandale*).

By the relative joints of the antennæ, and the markings of the head and pronotum, this small species is distinctly recognizable.

JUCUNDUS, gen. nov.

Head longer than broad between the eyes, which are moderately emarginate interiorly, in front of eyes almost triangulate where it is prominently notched on each side and then narrowed to apex which is angularly rounded, between the eyes two oblique foveations; antennæ with the first joint longest, about as long as the posterior area or lobe of the pronotum, second, third, and fourth joints subequal in length; rostrum scarcely passing the anterior coxæ; pronotum moderately flat, not prominently deflected behind the humeral angles, the anterior area or lobe short, about one-third the length of posterior area or lobe; hemelytra considerably passing apex of abdomen; anterior femora slightly thickened and longer than the tibiæ; intermediate and posterior femora about subequal in length, posterior tarsal claws inserted at apex of tarsus.

Allied to *Gerris*, but differing in the shape of the head and the structure of the pronotum.

Jucundus custodiendus, sp. n.

♀. Head and pronotum ochraceous; eyes, narrow lateral margins, and a central discal elongate spot to pronotum black; antennæ black; rostrum ochraceous with its apex black; hemelytra black, the marginal and apical areas more brownish; body beneath ochraceous, a spot on the posterior acetabular area black; legs black, anterior femora much longitudinally streaked with ochraceous; structural characters as in generic diagnosis.

Length 8 mm.

Hab. Travancore; Maddathoray, W. Base of W. Ghats (*Annandale*).

The above description is taken from a macropterous female specimen; in a second male apterous example, which measures 7 mm. the pronotum has a continuous broad central longitudinal fascia, not extending to the anterior area or lobe.

Jucundus burmanus, sp. n.

Apterous form.—Body and legs ochraceous, the intermediate

and posterior tibiæ piceous; eyes and a narrow central longitudinal line to pronotum black or piceous; abdominal segments piceous; legs with narrow black or piceous longitudinal lines; antennæ black, with the basal joint very long and somewhat stout, second joint less than one-third the length of first joint, remaining joints mutilated in type; anterior area or lobe of pronotum longer than in *J. custodiendus* and with a distinct central longitudinal black line; abdomen with six segments visible above in addition to the anal segment, which is ochraceous with a transverse black line; rostrum scarcely passing the anterior coxæ; anterior tibiæ dentately widened at apex.

Length $6\frac{1}{2}$ mm.

Hab. Upper Burma; North Shan Hills (*J. C. Brown*).

Two apterous forms received from Burma, by the structure of the head undoubtedly belong to *Jucundus*. They differ from the type *J. custodiendus* in having the antennæ more robust, the anterior pronotal area or lobe a little longer, and by the anterior tibiæ being more robust and dentately ampliate at apex.

Onychotrechus vadda, sp. n.

♂. Body above black; head with the lateral margins in front of eyes, and a central longitudinal fascia, ochraceous; antennæ piceous, basal joint paler beneath; pronotum with the anterior margin, lateral margins, and three longitudinal discal fasciæ (the central one straight, the lateral ones moderately curved) ochraceous; mesonotum with a narrow central straight longitudinal fascia, on each side of which is a broader angulate fascia, and a posteriorly attenuated lateral fascia, ochraceous; at base of abdomen a curved oblique fascia on each side, and a series of lateral marginal abdominal spots, ochraceous; body beneath and legs ochraceous; sternum with two longitudinal marginal black lines (the innermost short) on each side, and above the outermost a silvery white tomentose fascia; extreme apices of femora, tibiæ and tarsi, black; rostrum ochraceous with its apex black; antennæ with the first joint longest and curved, remaining joints subequal in length; rostrum considerably passing the anterior coxæ; intermediate slightly longer than posterior femora; tarsal claws long.

Length ♂ 5, ♀ 6 mm.

Hab. Ceylon; Peradeniya (*Green*), Madulsima, Sabrigama, Haputale, 4800 ft. (*Bainbrigge Fletcher*).

I have not yet seen a macropterous form of this species.

Onychotrechus kumari, sp. n.

Body above dull ochraceous ; head with a short central line at apex, two central oblique lines commencing on apical margin and meeting between the eyes, and a shorter longitudinal line near inner margin of each eye, black ; pronotum with four longitudinal black spots, two central and one near each lateral margin ; mesonotum with two central longitudinal lines, a continuous angulate line before each lateral margin, and two lateral lines, black, between the last the colour is silvery white tomentose ; abdominal segmental margins black ; rostrum, body beneath and legs pale ochraceous ; apex of rostrum, a submarginal linear fascia to sternum, and a short line before intermediate coxæ, black ; a silvery white spot on each side of posterior margin of prosternum, a similar but larger spot before intermediate coxæ, and a similar smaller spot near base of lateral margin of abdomen ; antennæ dull ochraceous, extreme apices of the first, second, and third joints and the whole of the fourth joint piceous or black, fourth joint longest, second shortest, first and third subequal in length, first moderately curved ; intermediate femora a little longer than posterior femora ; rostrum considerably passing the anterior coxæ ; tarsal claws long.

Length $4\frac{1}{2}$ mm.

Hab. Travancore ; Maddathoray, W. base of W. Ghats (*Annandale*).

I have only seen apterous forms of this species.

JANIAS, gen. nov.

Body longer than half the length of either intermediate or posterior legs ; head longer than broad, the apex obtusely angulate ; eyes large, oblique, interiorly moderately emarginate, posteriorly moderately extending over the anterior angles of the pronotum ; antennæ short, robust, first joint straight, longest, longer than head, distinctly inwardly spinous at apex, second and fourth joints subequal in length, third shortest ; rostrum short, robust, reaching but not extending beyond the anterior coxæ ; pronotum about as long as head, narrowed anteriorly behind the eyes, with a central impressed longitudinal line, the posterior margin truncate ; mesonotum more than twice as long as pronotum, the disk centrally longitudinally impressed ; anterior femora longer than the tibiæ, obtusely spined at apex, intermediate and posterior femora subequal in length.

Allied to *Cylindrostethus* but differing in the shorter

antennæ, the less anteriorly produced head and the more posteriorly produced eyes, &c.

The description is founded on an apterous form.

Janias elegantulus, sp. n.

Head dark brownish ochraceous, eyes and antennæ black; pronotum black, the lateral and posterior margins and a broad, central, longitudinal subtriangular fascia dull ochraceous; mesonotum castaneous brown, beyond middle with a large central oblong black spot which contains a broad central longitudinal line with a large spot on each side, pale ochraceous; abdomen above dull brownish ochraceous, with paler markings on lateral margins and darker central segmental spots; body beneath and legs ochraceous; head beneath, apex of rostrum, apices and longitudinal streaks beneath to anterior femora and the whole of the anterior tibiæ and tarsi, black; intermediate and posterior legs slightly infusate; pronotum moderately foveately depressed on disk; other structural characters as in generic diagnosis.

Length (apterous form) 11 mm.

Hab. Travancore; Kulattupuzhd, W. base of W. Ghats (*Annandale*).

Division HALOBATINARIA.

EURATAS, gen. nov.

Head large, somewhat flattened, apically subangulately produced and also angularly produced above the insertion of the antennæ; eyes somewhat flattened, rounded interiorly, a little posteriorly produced over the anterior margins of the pronotum; antennæ with the first joint longest, as long as the anterior femora, second not half as long as first, third shortest, a little shorter than fourth; rostrum not passing the anterior coxæ; pronotum slightly shorter than head, anterior and posterior margins sinuate, the lateral margins rounded, two distinct foveate impressions on disk which are anteriorly margined with a carinate line; mesonotum about twice the length of pronotum; anterior femora in male strongly incrassated, anterior tibiæ with a long robust spine before middle, anterior femora in female only moderately thickened, the anterior tibiæ unarmed; intermediate legs pilose, intermediate femora considerably longer than the posterior femora.

Allied to the genus *Hermatobates*, Carp.

Euratas formidabilis, sp. n.

Body above bluish, more or less finely greyishly pilose; antennæ black, finely pilose, base of first joint pale ochraceous; head with the apical and lateral areas pale greyish, basal margin transversely linearly ochraceous but centrally broken; eyes castaneous brown, their basal margins dull ochraceous; pronotum with two discal pale foveations, the upper margins of which, and a central more or less connecting line, are black; apical half of abdomen above paler and more greyish in hue, the segmental margins darker; anal appendage blackish; legs bluish, more or less greyishly pilose, the anterior legs beneath ochraceously pilose, the acetabula, abdomen beneath, and anal appendage more or less ochraceous; structural characters as in generic diagnosis.

Length, ♂ 5 mm., ♀ 5 to 5½ mm.

Hab. Andaman Sea (Indian Marine Survey—*Alcock*).

FABATUS, gen. nov.

Head large, declivous in front, subquadrate, obtusely apically angulately produced and also distinctly angulate on each side above the insertion of the antennæ; eyes of moderate size, substylate, moderately emarginate at interior margins, a little projecting beyond the anterior margin of the pronotum; antennæ with the first joint longest, a little shorter than the anterior tibiæ, third shortest, second and fourth subequal in length; rostrum short, robust, not passing anterior coxæ; pronotum shorter than head, transverse, the lateral margins moderately rounded, posterior margin a little concave; mesonotum elongate, convex, slightly more than twice the length of pronotum; anterior legs slightly thickened, more so in the male than in the female, anterior tibiæ apically inwardly spinous and in the male with a strong, robust spine near middle, in female unarmed; intermediate and posterior legs slender, intermediate considerably longer than the posterior; the intermediate tibiæ very strongly curved, intermediate tarsi much longer than the posterior tarsi.

This genus in general appearance somewhat resembles the marine species represented by *Halobates*, but differs by the emarginate inner margins of the eyes; it is, however, a truly marine species and I retain it in the Halobatinaria. I have as yet only seen undeveloped forms, collected by Dr. Alcock on the Indian Marine Survey.

Fabatus servus, sp. n.

Head ochraceous with a broad central longitudinal spot

and a linear longitudinal spot on each side, black, the base greyish white, the apex blackish; eyes ochraceous or brownish ochraceous; antennæ castaneous brown, the base of first joint much paler, the fourth joint darker; pronotum greyish white, with a large transverse purplish-brown spot in each lateral area; mesonotum greyish white, with a broad longitudinal purplish-brown fascia in each lateral area; abdomen above greyish white, with transverse segmental purplish-brown spots; body beneath greyish white; rostrum castaneous brown, the basal joint ochraceous; legs dark castaneous brown or shining piceous, bases of anterior femora broadly pale ochraceous; structural characters as in generic diagnosis.

Length $4\frac{1}{2}$ to 5 mm.

Hab. Andaman Sea (Indian Marine Survey—*Alcock*).

Metrocoris nepalensis, sp. n.

Head ochraceous with a large central oblong black spot; antennæ black, base of first joint broadly pale ochraceous; pronotum black, with two curved transverse ochraceous lines on posterior margin; mesonotum black, the lateral margins and two discal angularly curved narrow fasciæ ochraceous; body beneath black with silvery white pubescence; legs black; coxæ, trochanters, a longitudinal streak to anterior femora above, bases of anterior femora beneath and apex of abdomen beneath, ochraceous; rostrum ochraceous, its apex black and reaching the anterior coxæ; antennæ with the first joint long, only a little shorter than the anterior tibiæ, second joint a little more than half the length of first (remaining joints mutilated in typical specimens); anterior tibiæ distinctly inwardly spinous at apex; intermediate femora slightly longer than posterior femora; body above shortly and a little more palely pilose.

Length $4\frac{1}{2}$ to 5 mm.

Hab. Nepal; Katmandu and Soondrijal (*Anandale*).

I have not seen a macropterous form of this species.

GERASTRATUS, gen. nov.

Head about as broad as long, the apex transversely rounded, the disk between the eyes strongly roundly foveate; eyes with the inner margins truncately rounded, moderately produced posteriorly over the lateral margins of the pronotum; front of head perpendicularly depressed to rostrum, which is short, stout, and not passing the anterior coxæ; antennæ moderately long, first joint a little curved and about as long as the anterior tibiæ, second, third, and fourth joints subequal

in length, second and third together only a little longer than first; pronotum short, considerably shorter than head, the lateral margins oblique, the posterior margin truncate; mesonotum more than twice as long as pronotum; anterior femora a little thickened, longer than the tibiæ, which are inwardly spinous at apex; intermediate and posterior femora almost equal in length, the intermediate longer than the posterior tibiæ; posterior tarsi about half the length of posterior tibiæ.

Allied to *Metrocoris*, from which it differs by the structure of the head.

Gerastratus foveatus, sp. n.

Head ochraceous, a large black spot in front of the discal foveation which is inwardly margined with black; antennæ black, the basal joint ochraceous at base; eyes black, brownish ochraceous at base; pro- and mesonota ochraceous; pronotum anteriorly, sublaterally, and centrally-longitudinally black; mesonotum with three longitudinal black fasciæ not reaching the posterior margin, the central fascia straight, the other two broader and slightly curved, a more obsolete black fascia on each lateral margin; body beneath ochraceous; anterior femora ochraceous, broadly outwardly streaked with black, anterior tibiæ and tarsi black, intermediate and posterior legs black, intermediate femora beneath streaked with ochraceous, coxæ and trochanters ochraceous with black markings; abdomen above black, with a large longitudinal lateral ochraceous spot and with a small spot of the same colour above the insertion of the intermediate legs; structural characters as in generic diagnosis.

Length $3\frac{1}{2}$ mm.

Hab. Kumaon; Bhim Tal, 4500 feet (*Annandale*).

A single apterous specimen taken by Dr. Annandale and now in the Indian Museum.

VENTIDIUS, gen. nov.

Head longer than broad, roundly truncate anteriorly; eyes large, oblique, their inner margins rounded, directed backward beyond the anterior margin of the pronotum; antennæ with the first and second joints distinctly and somewhat longly hirsute, second joint less prominently hirsute than the first which is about as long as the anterior femora, second and third subequal in length, each a little longer than the fourth; pronotum about as long as breadth between the pronotal angles, the lateral margins oblique, the anterior narrowing to head, the posterior narrowing to apex, which is broadly obtusely angu-

late; hemelytra passing the abdominal apex; rostrum short, scarcely passing the anterior coxæ; legs slender, anterior femora about as long as the anterior tibiæ, inwardly a little spinous at apices, intermediate femora longer than posterior femora (macropterous form).

In the apterous or undeveloped form the pronotum is considerably shorter than broad.

Allied to *Metrocoris*, but with the body shorter and broader, and with hirsute antennæ.

Ventidius aquarius, sp. n.

Macropterous form.—Head and pronotum ochraceous, the latter with a large cruciform fascia and the sublateral and apical margins black; eyes black; antennæ black, base of first joint ochraceous; hemelytra black; body beneath ochraceous; legs and apex of rostrum black, bases of anterior femora ochraceous; acetabula and coxæ spotted with black; structural characters as in generic diagnosis.

Apterous form.—Body above ochraceous; pronotum with a narrow sublateral fascia, angulated and reaching margin at humeral angle, and two spots at centre of posterior margin continued obliquely across mesonotum, black, other markings generally as in macropterous form; abdomen above ochraceous with the segmental margins black.

Length, *macropt. form* 5 mm., *apt. form* $4\frac{1}{2}$ mm.

Hab. Travancore; Pallode, 20 miles N.E. of Trivandrum (*Annandale*).

"On roadside jungle-stream" (*N. Annandale*).

EUODUS, gen. nov.

Head slightly longer than broad, the angles in front of eyes slightly prominent; eyes oblique, their inner margins rounded, moderately extending over the lateral margins of the pronotum; antennæ with the first joint longest, a little curved, shorter than the anterior tibiæ, second and third joints about equal in length, each shorter than first and longer than fourth; rostrum slightly passing the anterior coxæ; pronotum short, shorter than head, narrower than mesonotum, the lateral margins a little rounded, posterior margin truncate and very slightly sinuate; mesonotum large, posteriorly widened, nearly twice broader at base than long, centrally longitudinally impressed, the anterior angles distinctly projecting beyond the pronotum, the lateral margins oblique, the basal margin truncate, laterally obliquely subangularly rounded to humeral angles, the basal area with

two transverse, curved carinate lines, the anterior one laterally continued upward; abdomen above, in male, with the margins upwardly laminately produced and reflected, the lateral margins convexly produced, the posterior segmental margin before the anal appendage truncately sinuate; anterior femora a little longer than anterior tibiæ, which are unarmed in both sexes, intermediate femora a little longer than posterior femora, the intermediate tibiæ distinctly longer than the posterior tibiæ.

Allied to *Metrocoris*, from which it differs by the shorter and broader mesonotum, the different structure of the abdomen above, different shape of the head, &c.

Euodus communis, sp. n.

Body above brownish ochraceous; head with a broad central longitudinal black fascia; eyes and antennæ black; pronotum with three longitudinal black fasciæ, the central straight, the other two oblique, all three anteriorly connected by a transverse black line; mesonotum with three central longitudinal black fasciæ, not reaching base, the central fascia straighter and narrower, between the transverse carinate lines a curved subbasal black fascia not quite reaching the humeral angles; abdomen above blackish; body beneath pale ochraceous; legs blackish; large spots to intermediate and posterior acetabula pale ochraceous, coxæ and trochanters more or less brownish ochraceous, anterior femora longitudinally fasciated with pale ochraceous; structural characters as in generic diagnosis.

Length 4 to $4\frac{1}{2}$ mm.

Hab. Kumaon, Sath Tal, 4000 feet (*Annandale*).

NABOANDELUS, gen. nov.

Body short and broad; head about as long as breadth between eyes, which are rounded, not inwardly emarginate but somewhat truncate, scarcely projecting over the anterior angles of the pronotum; antennæ moderately robust, first joint longest, longer than head, moderately curved, second, third, and fourth joints almost subequal in length; rostrum reaching the anterior coxæ; pronotum short and transverse, considerably shorter than head, the anterior margin truncate, the posterior margin moderately convex; mesonotum more than twice as long as pronotum, nearly twice as broad at base as long, the lateral margins convexly rounded and narrowing towards pronotum; abdomen in female about as long as pro- and mesonota together, in male a little longer;

anterior femora a little longer than the tibiæ, the tarsi robust and only a little shorter than the tibiæ, intermediate legs much longer than the posterior legs, the femora almost subequal in length and shorter than the body, the intermediate tibiæ longer than the femora and much longer than the posterior tibiæ.

All the specimens which I have seen are apterous.

Naboandelus signatus, sp. n.

Black ; thickly, shortly pilose ; head with the anterior and inner margins greyish, the inner margins at eyes connected at basal margin, ochraceous ; pronotum with a large central ochraceous spot ; lateral margins of mesonotum greyish ; body beneath bluish ; rostrum (excluding apex), an elongate spot at posterior acetabula, and the anal segment and appendage ochraceous ; legs and apex of rostrum black, more than basal halves of femora ochraceous ; lateral margins of the mesonotum somewhat longly pilose ; structural characters as in generic diagnosis.

Length, ♂ and ♀, 2 mm.

Hab. Calcutta (*Ind. Mus.*).

This species is found in the Calcutta tanks.

NACEBUS, gen. nov.

Body subelongate ; head about as long as breadth between eyes, the apex broad and subtruncate, the lateral apical angles distinctly subprominent, eyes inwardly somewhat rounded or roundly truncate, not emarginate, not produced over the anterior margins of the pronotum ; antennæ with the first and second joints stouter than third and fourth joints, first joint about as long as head, second shortest, only a little more than half the length of first, third and fourth subequal in length, each a little shorter than first ; rostrum reaching the intermediate coxæ ; pronotum very short, almost appearing only as a broad anterior collar ; mesonotum three times as long as pronotum, the anterior and posterior margins truncate, the lateral margins a little roundly oblique ; abdomen (excluding anal appendage) about as long as head and pro- and mesonota together, the anal appendage long and slender ; anterior legs moderately stout, the femora twice as long as the tibiæ, the anterior tarsi short, robust, about half as long as the tibiæ ; intermediate legs much longer than posterior legs, intermediate femora nearly as long as body, the intermediate tibiæ a little shorter than the femora, intermediate tarsi about half the length of the tibiæ.

The above description is taken from a number of apterous forms received from different localities. *Nacebus* is allied to *Rhagadotarsus*, Bredd., from which it differs by the structure of the head and thorax.

Nacebus dux, sp. n.

Body above and beneath, antennæ, rostrum and legs black; pronotum, anterior femora (excluding apices), acetabulæ, coxæ, and trochanters ochraceous; disk of mesonotum and abdomen distinctly more opaque in coloration; structural characters as in generic diagnosis.

Length (incl. anal append.) 4 mm.

Hab. Calcutta. L. Burma; Mudon, Amherst Distr. (*Annandale*).

At Calcutta the species was found in the tanks.

XIX.—*On the Lamellicorn Beetles of the Genus Peltonotus with Descriptions of four new Species.* By GILBERT J. ARROW.

(Published by permission of the Trustees of the British Museum.)

I SUGGESTED in a recent paper (Trans. Ent. Soc. Lond. 1908, p. 355) that the genus *Peltonotus* should be transferred from the Dynastidæ, in which it has hitherto been placed, to the Rutelidæ. These two groups have the closest relationship and no natural and obvious line of division appears between them. Almost the only definable distinctive features of the Dynastinæ, as it is perhaps preferable to call them, are the fixed and equal claws (at least of the four posterior legs) and the concealed labrum, and neither of these characteristics is found in *Peltonotus*. The former feature, however, is infringed by various species of the *Cyclocephala* group of genera, in which group also the clypeus, normally reduced in the Dynastinæ, is large, as in the Rutelinæ, while the mandibles on the contrary are small. In this group *Peltonotus* has hitherto been included, but in the remaining differential character (the rudimentary and concealed labrum) it is strikingly different, for the labrum is largely exposed and highly chitinized. This connects the genus more nearly to the Rutelinæ than to *Cyclocephala*, the only genus of Dynastinæ with which it can be compared. The horizontally extruded labrum appears to be a survival of

a primitive condition, as it is found in *Passalidæ*, *Geotrupinæ*, and other primitive groups. Nothing resembling it is found in *Dynastinæ*, but it is not very different from the labrum of the Rutelid *Peperonota*. The loosely-jointed body and long legs are in marked contrast to that genus and its allies and are certainly more suggestive of relationship with *Cyclocephala*. The scarcely developed prosternal process is a feature adverse to this affinity, and the elongate basal joint of the posterior tarsi is found neither in *Cyclocephala* nor in *Peperonota*, but occurs in *Desmonya* and *Oryctomorphus*, two genera which have similar affinities in both directions. A feature found in the female of *Peltonotus*—viz., the abrupt expansion of the outer margins of the elytra near the middle—is found both in *Cyclocephala* and various genera of Rutelinæ (e. g. *Anomala*, *Macraspis*, *Fruhstorferia*). While recognizing the relationship of *Peltonotus* to both *Dynastinæ* and Rutelinæ, it seems best to regard the condition of the labrum as the crucial diagnostic feature and to assign the genus to the *Parastasia* group of Rutelinæ, forming the rather heterogeneous, but probably truly related mass of genera in which the two subfamilies meet.

Only a single species of the genus (*P. morio*, Burm.) has yet been described, for the *Melolontha scarabæina*, Gyll., originally added by Burmeister, was afterwards referred by him to *Cyclocephala*, and it is probably really an American insect. I have now to describe three new species in the British Museum, in addition to which M. Oberthür possesses an example of yet another (from North Borneo), unfortunately unique, but highly interesting from the fact that the prothorax and elytra are prettily decorated with golden-red stripes.

The two sexes differ considerably in this genus, but the male alone has at present been described, from a specimen seen by Burmeister in the collection of the Entomological Society of London, taken by Maj.-Gen. Hardwicke. This collection is no longer in existence, but the Hardwicke Collection, containing two females of *P. morio*, is in the British Museum. From the considerable series in our collection I here shortly describe the two sexes.

Peltonotus morio, Burmeister, Handb. v. 1847, p. 75.

Niger, nitidus, capite, prothoracis lateribus, pygidio, pedibus corporeque subtus longe rufo-hirto; capite rugoso, labro integro, clypeo inermi; prothorace crebre punctato; scutello vix punctato; elytris irregulariter punctatis:

♂, elytris sat crebre minus æqualiter punctatis; pedibus longis ac validis, tibiis anticis brevissime tridentatis, unguibus anticis valde inæqualibus:

♀, elytris magis fortiter et æqualiter punctatis, lateribus post medium paulo dilatatis; pedibus simplicis, tibiis anticis fortiter tridentatis.

Long. 16–19 mm.; lat. max. 8–10 mm.

Hab. NEPAL; BHUTAN; SIKKIM; ASSAM: Manipur; BURMA: Momeit, N. Chin Hills.

The head is entirely rugose and the clypeus transversely rectangular and not toothed. The pronotum is rather closely but finely punctured and fringed with long reddish hairs at the sides, similar hairs also arising from the dorsal surface in the neighbourhood of the front angles. The elytra are well punctured, the punctures being stronger in the females and showing a greater tendency to run into rows. In that sex the elytra are also dilated at the sides behind the middle, and in the male the legs are very much enlarged and thickened, the claw-joint and inner claw of the front tarsus being of enormous size.

Peltonotus nasutus, sp. n.

Niger, nitidus, grandis, sat latus, pedibus, corpore subtus, capite pygidioque longe fulvo-setosis; capite rugose punctato, margine antica arcuata, medio breviter tuberculata; prothorace minute, sat late æqualiter punctato, marginibus lateralibus cum basi regulariter arcuatis, hoc utrinque vix impresso; scutello paulo punctato; elytris apice paulo opacis; propygidio sat crebre, pygidio parce, punctato; metasterno rugose punctato, dense hirsuto:

♂, elytris lævibus, inconspicue punctatis; pedibus anticis crassis, tibiis anticis brevissime tridentatis:

♀, elytris fortiter seriato-punctatis, laterum medio paulo dilatato, calloso.

Long. 18–20 mm.; lat. max. 9·5–11 mm.

Hab. SIAM: Laos (*Vientane*); COCHINCHINA: Kon Hengungo; BURMA; NEPAL (*teste Lansberge*).

This species is very like *P. morio*, but larger, with the pronotum much less punctured and not hairy, the elytra less punctured in both sexes, although more regularly and distinctly in the female. The clypeus is rounded in front, and there is a tubercle in the middle of the front margin in both sexes. In the male the mandibles are rather quadrate.

Peltonotus malayensis, sp. n.

Niger, nitidus, elytris sericeo-pruinosis, obscure iridescentibus, corpore subtus breviter fulvo-hirto; capite crebre punctato;

clypeo brevi, quadrato; prothorace fortiter, medio parcius punctato, lateribus angulato-rotundatis, basi leviter arcuato, utrinque profunde impresso; scutello paulo punctato; elytris (♀) profunde striatis, striis grosse annulato-punctatis, lateribus post medium angulatim dilatatis; propygidio minute et crebre, pygidio grosse, punctato, opaco; metasterno crebre rugoso-punctato, segmento utroque ventrali medio seriatim punctato et setoso, ultimo grosse irregulariter punctato; tibiis anticis fortiter tridentatis.

Long. 14.5–15.5 mm.; lat. max. 7–8 mm.

Hab. E. BORNEO: Pontianak, Sintang; SUMATRA: Siboga.

I have seen only three female specimens of this interesting species, two of which are in M. René Oberthür's collection, while the type he has kindly presented to the British Museum.

It is rather smaller than *P. morio*, and remarkable for the iridescent bloom, like that of a black grape, with which the elytra are covered. The clypeus is straight in front and has no trace of a tubercle. The pronotum is strongly punctured and bears a deep impression at the base on each side. The elytra are very deeply and coarsely punctate-striate, and there is an angular projection placed well behind the middle of the outer margin of each. The last feature is certainly peculiar to the female.

Peltonotus pruinosis, sp. n.

Niger, nitidus, elytris sericeo-pruinosis, obscure iridescentibus, corpore subtus breviter et parce fulvo-hirto; capite sat crebre punctato, clypeo subquadrato, brevi; prothorace laxè sed distincte punctato, lateribus fortiter arcuatis, basi arcuato, utrinque profunde impresso; scutello lævi, vix punctato; elytris (♀) profunde striatis, striis grosse annulato-punctatis, lateribus ante medium fortiter impressis margineque hic reflexo, haud dilatato; propygidio, pygidio metasternoque nitidis, grosse haud crebre punctatis, segmento ventrali utroque medio seriatim punctato et setoso, ultimo parce et irregulariter haud grosse punctato; tibiis anticis longe et acute tridentatis.

Long. 15 mm.; lat. max. 8 mm.

Hab. ASSAM: Brahmapootra Valley.

A single female specimen taken by the late W. Doherty is in the British Museum collection.

P. pruinosis closely resembles *P. malayensis*, but in the female sex is at once distinguished by the outer margins of the elytra, which are not dilated as in the latter species, but

bear a deep impression just behind the shoulder, the edge at that spot being strongly reflexed. The pronotum is rather less strongly punctured, the metasternum is not rugose at the sides, the pygidium is shining, and the front tibiæ are more sharply toothed.

Peltonotus vittatus, sp. n.

Niger, supra omnino sericeo-opacus, prothoracis lateribus elytrisque luride flavis, singulo elytro vittis duabus obliquis ab humero ad angulum suturale ductis margineque externa antice nigris, corpore subtus parce fulvo-hirto; capite sat crebre punctato, clypeo subquadrato, brevi; prothorace laxè sat distincte punctato, lateribus et basi omnino valde arcuatis, basi utrinque fortiter impresso; scutello paulo punctato; elytris (♀) regulariter punctato-striatis, lateribus post medium angulatim dilatatis; propygidio parce pygidioque densius et fortius punctatis, sericeis; metasterno fortiter, abdomine parce, segmento ultimo grosse haud crebre, punctatis; tibiis anticis acute tridentatis.

Long. 14 mm.; lat. max. 7 mm.

Hab. NORTH BORNEO.

The unique type specimen is a female in the collection of M. René Oberthür, who acquired it from Dr. D. Sharp. The species is the smallest and most striking in the genus. The whole upper surface has a silky bloom, the prothorax has the lateral margins orange-coloured (almost interrupted, however, in the middle), and the elytra are orange, with two black stripes running parallel from each shoulder to the apical angles. The anterior part of the outer edge and the remainder of the body are black. There is an angular dilatation of the elytral margin behind the middle, as in the female *P. malayensis*.

The following table contains a few of the distinctive features of all the species of *Peltonotus* at present known:—

Pygidium clothed with long tawny hair; labrum not bilobed.	
Clypeus without a marginal tooth	<i>morio</i> , Burm.
Clypeus with a marginal tooth	<i>nusutus</i> , sp. n.
Pygidium without hairy clothing; labrum bilobed.	
Pygidium shining	<i>pruinusus</i> , sp. n.
Pygidium covered with opaque silky bloom.	
Colour black	<i>malayensis</i> , sp. n.
Colour black and orange	<i>vittatus</i> , sp. n.

XX.—*Crustacea collected by the late Mr. R. L. Ascroft and Mr. Harvey in the North of the Bay of Biscay.* By ALFRED O. WALKER, F.L.S., F.Z.S.

IN June 1895 Mr. Ascroft went in the steam trawler 'Britannia' to the northern part of the Bay of Biscay, where trawling for commercial purposes was carried on off the Isle de Yeu and Belle Isle. By attaching a tow-net to the back of the trawl Mr. Ascroft collected a considerable number of Crustacea, as shown in the list below. Mr. Harvey was the engineer of the 'Britannia,' and probably obtained his specimens at the same time. Unfortunately there is no record of the depths at which they were taken, but these would probably not exceed 100 fathoms. Some of the species, such as *Macropodia longirostris*, *Bodotria scorpioides*, *Pseudocuma longirostris*, *Orchomenella nana*, *Periculodes longimanus*, and *Apherusa bispinosa*, indicate quite shallow water, while *Solenocera siphonocerus*, on the only other recorded occasions of its capture north of the Mediterranean (viz. off the W. of Ireland in the R. Irish Acad. expeditions of 1886 and 1888), occurred in 325 fath. and 345 fath. respectively*. Other interesting species are *Chlorotocus gracilipes*, previously only once taken, viz. by the 'Travailleur' off the N. coast of Morocco in 332–370 metres; *Procampylaspis armata*, only known from a single specimen taken by the 'Caudan' in the Gulf of Gascony at a depth of 950 metres; *Leptostylis walkeri*, new to science; *Podoprion bolivari*, taken by M. Chevreux in Vigo Bay in 1889 and not since recorded; *Halicoides anomalus*, new to science; and the hitherto undescribed male of *Monoculodes gibbosus*.

BRACHYURA.

1. *Gonoplax rhomboides* (Linn.). Four or five young. H.
2. *Xantho tuberculata*, Couch. Seven or eight. H.
3. *Atelecyclus 7-dentatus* (Mont.). Four young. H.
4. *Portunus depurator*, Leach. One young. H.
5. *Macropodia longirostris* (Fabr.). Two. A.
6. *Ebalia tuberosa* (Pennant). Three—one young. H.
7. — *cranchii*, Leach. One. H.

ANOMURA.

8. *Anapagurus levis* (Thompson). One young. H.
9. *Galathea dispersa*, Bate. Several. H., A.
10. *Munida bamffica* (Penn.). Young. H.

* Calman, Trans. R. I. Acad. 1896, vol. xxxi. p. 14.

MACRURA.

11. *Cheraphilus nanus* (Kröyer). Seven. H., A.
12. *Chlorotocus gracilipes*, M.-Edw.
13. *Pandalus brevirostris*, Rathke. One. A.
14. *Nika edulis*, Risso. A.
15. *Solenocera siphonocerus* (Philippi). H., A.

SCHIZOPODA.

16. *Nyctiphanes couchii* (Bell). Several. H.
17. *Leptomysis gracilis*, G. O. Sars. A.
18. *Siriella norvegica*, G. O. Sars. A.

CUMACEA.

19. *Bodotria scorpioides* (Montagu). A.
20. **Iphinoë serrata*, Norman. A.
21. **Eudorella truncatula* (Sp. Bate). A.
22. **Procampylaspis armata*, Bonnier. A.
23. **Campylaspis glabra*, G. O. Sars. A.
24. *—— *macrophthalmia*, G. O. Sars. A.
25. *Pseudocuma longicornis*, Sp. Bate. A.
26. *Diastylodes biplicata*, G. O. Sars. A., H.
27. *Diastylis bradlii*, Norman. ♂ & ♀.
28. **Leptostylis walkeri*, Calman. A.

ISOPODA.

29. *Cirolana borealis*, Lillj. A.
30. *Astacilla longicornis* (Sowerby). A.

AMPHIPODA.

31. *Parathemisto oblivia* (Kröyer). A., H.
32. *Podoprion bolivari*, Chevreux, Mém. Soc. Zool. de France, 1891, tome iv. p. 6, pl. i. A., H.
33. *Ichnopus spinicornis*, Boeck. A.
34. *Scopelocheirus hopei* (A. Costa), = *Callisoma kröyerii* (Bruz.). A., H.
35. *Tryphosites longipes* (Sp. Bate). A., H.
36. *Orchomenella nana* (Kr.). H.
37. *Ampelisca spinipes*, Boeck. H., A.
38. ——— *typica*, Bate. A.
39. ——— *tenuicornis*, Lillj. H.
40. *Peltocora brevirostris* (T. & A. Scott). A.
41. *Probolium gregarium*, G. O. Sars. A.
42. *Iphimedia obesa*, Rathke. A., H.
43. *Haliconides anomalus*, A. O. Walker, Ann. & Mag. Nat. Hist. (6) vol. xvii. 1896, p. 344, pl. xvi. figs. 7-18. A.
44. *Periculodes longimanus* (Bate). A.
45. *Westwoodilla cæcula* (Bate), = *Halimедon parvimanus* (Bate and Westwood). H., A.
46. *Monoculodes gibbosus*, Chevreux. ♂. A.
47. *Apherusa clevei*, Sars (Publ. Expl. Mer. no. 10, 1904, p. 3, pl. i.). A.
48. ——— *bispinosa* (Bate). H.
49. *Melphidippella macera* (Norman). A., H.

* See Calman, Bull. Mus. Hist. Nat. 1907, no. 2, p. 116.

50. *Eusirus longipes*, Boeck. A., H.
 51. *Cheirocratus sundevallii* (Rathke). A.
 52. *Mæra tenuimana* (Bate), = *Mæra batei*, Norman. A.
 53. *Eurystheus maculatus* (Johnst.). H.
 54. *Phisica marina*, Slabber. H.

Diastylis bradyi, Norman, 1879, "Cumacea of 'Lightning' &c. Expeditions," Ann. & Mag. Nat. Hist. ser. 5, vol. iii. p. 59, ♀.

1888. *Diastylis bradyi*, Norm., A. O. Walker, Proc. Biol. Soc. Liverpool, vol. ii. p. 178, ♀.

1890. *Diastylis spinosa*, Norm., id. ibid. vol. iv. p. 247, ♀ & ♂.

1892. *Diastylis spinosa*, Norm., id. ibid. vol. vi. p. 104, ♀ & ♂.

1896. *Diastylis spinosa*, Norm., Brit. Assoc. Report on Marine Zoology of the Irish Sea.

1908. ? *Diastylis bradyi*, Norman and Brady, Crust. Northumberland and Durham.

When I first took the male of this species (previously unknown) with the female of *D. bradyi* in Colwyn Bay, it appeared to me to agree so well with Canon Norman's description of his earlier species, *D. spinosa*, that I referred it to that. As, however, Canon Norman now places his *D. spinosa* under *D. rathkei* (Kröyer) *, it is evident that I was in error.

Monoculodes gibbosus, Chevreux, Bull. Soc. Zool. de France, t. xiii. (1888), ♀.

Monoculodes gibbosus, Chevr. Result. Camp. Monaco, vol. xvi. p. 59, t. viii. fig. 3, ♀.

Monoculodes gibbosus, Chevr., Stebbing, Das Tierreich, Amph. Gamm. pp. 259, 726, ♀.

Monoculodes gibbosus, Chevr., ♂.

Body wide in front, carinate, hind margins of first nine segments elevated; the carina on the third and fourth pleon segments conspicuously raised and arcuate; sides of the sixth pleon segment produced almost to the end of the telson in an acute angle.

Head a little longer than the first four segments, with a carina separating the large dark oval eyes. Rostrum large, reaching nearly to the distal end of the second joint of ant. 1, evenly curved.

Side-plate 1 expanded in front and fringed.

* "Crust. of Northumberland and Durham," by Norman and Brady, Trans. Nat. Hist. Soc. Northumberland &c., new ser. vol. iii. part 2, p. 29.

Ant. 1 longer than the head, reaching to the fourth joint of the flagellum of ant. 2; first joint considerably longer than second and third united and not much wider than the second, the upper margin of which is produced almost to the end of the third; flagellum to peduncle as 7:5, with ten joints, the first as long as the next three united, setose.

Ant. 2: peduncle reaching to the seventh joint of the flagellum of ant. 1, last joint slightly longer than the preceding, with its extremity a little dilated and truncate; flagellum long and slender, reaching to the end of the pleon, with numerous short joints, naked.

Gnathopods and their side-plates as in *M. carinatus*, Bate.

First and second peræopods with the dactyli almost as long as the sixth joints; third and fourth pair have the dactyli relatively longer. The fifth are broken in all the specimens.

Uropod 1: peduncle much shorter than the subequal rami, spinulose; a few spinules on the outer margin of the outer ramus.

Uropod 2: peduncle subequal to inner ramus, outer shorter, both smooth; a few spinules on outer margin of peduncle.

Uropod 3: wanting in the seven specimens examined.

Telson in a young male rounded at the end, with two setules rather close together at the tip.

Length of adult male 7 mm. Only males were taken.

A specimen was sent to M. Chevreux in 1899, and he informed me that he considered it to be without doubt the male of his species. Unfortunately it is one of those brittle forms that easily lose their appendages, so that a full and accurate description is impossible. Thus all the peræopods in M. Chevreux's single specimen and the fifth pair in all mine were mutilated, and the third uropods in both cases entirely wanting. I agree with M. Chevreux that they are the same species, though the (presumably) sexual differences are considerable, the most conspicuous and unusual being the prominent arcuate carina on the fourth pleon segment, as well as on the third, in the male. M. Chevreux's specimen was taken in the "Gulf of Gascony" at a depth of 180 metres. It may be mentioned that the so-called tubercle on the second joint of the peduncle of ant. 1 in the male is a prolongation of the upper margin of the joint and not of the lower as shown in M. Chevreux's figure. It is not easy to see till the antenna is separated from the head.

XXI.—On some new Species of Silver-Pheasants.

By EUGENE W. OATES.

Gennæus atlayi, sp. n.

♂.—Allied to *G. rufipes*, Oates, but with the nature of the markings on the upper plumage reversed, that is to say that the black stripes are wider than the white ones, giving the bird a very dark appearance.

Crest blue-black. The sides of the head and neck coarsely squamated with black. The mantle and back marked with alternating black and white stripes, of which the former are nearly twice as wide as the latter. Rump similarly marked, but the figure formed by each pair of stripes more rounded. On the wing-coverts the black streaks are three or four times as broad as the white interspaces. The primaries black, barred with white. The middle pair of tail-feathers chiefly white on the inner web, white barred with black on the outer web; the remaining feathers progressively more and more barred, the outermost feather being almost entirely black. Lower plumage glossy black, the feathers on the sides of the neck and breast, at the junction of the striped upper plumage and the black lower plumage, being white on one web and striped on the other. Legs coral-red.

Wing 11 inches, tail 18.

♀.—Whole upper plumage rufous brown, slightly vermiculated with black. Lower plumage very dark brown or blackish, the webs of each feather with three or four diagonal buff bands, very irregular and jagged, and much narrower than the black interspaces. The bands on the one web meet those on the other at a sharp angle on the shaft. Tail barred and mottled with black, chestnut, and buff. Legs coral-red.

Wing 9·6 inches, tail 10·4.

Numerous specimens of this species have been sent to me by Mr. Frank Atlay from various places in the Ruby Mines District, and I have much pleasure in naming the bird after him, in recognition of the great interest he has taken in collecting pheasants for me.

Gennæus haringtoni, sp. n.

♂.—Of the same type as *G. rufipes* and *G. atlayi*, inasmuch as it has red legs and a striped upper plumage, but differing greatly in the character of the markings.

Crest blue-black. Sides of the head and neck delicately squamated with black. The mantle and back marked with numerous white stripes on a black ground. These stripes are very numerous, some six or seven on each web, and about half the width of the black interspaces. They are, moreover, extremely twisted and jagged and the respective pairs meet on the shaft in an involved manner. The rump is similarly marked, but the black interspaces are wider and the respective pairs of white stripes form somewhat quadrate figures. The outermost white band also is much broader than the others and forms a very conspicuous margin to the feather. On the wing-coverts the white stripes are only a quarter of the width of the black interspaces. The quills of the wing are very narrowly barred with white. The tail and the lower plumage resemble the same parts in *G. attayi*. Legs coral-red.

Wing 10·2 inches, tail 16·25.

♀.—Whole upper plumage rufous brown. Lower plumage black, the webs of each feather with several very irregular, jagged, and zigzag white bands, running obliquely and meeting at the shaft in a very involved and confused manner. The middle tail-feathers are nearly uniform brown; the others are barred and mottled with black, chestnut, and buff. Legs coral-red.

Wing 10 inches, tail 10·6.

A male and female were shot by Major H. H. Harington at Nilum Kha, in the Bhamo District, Burma, in March 1908.

Gennæus granti, sp. n.

♂.—Crest blue-black. Sides of the head and neck squamated with black. Mantle and back marked with white stripes on a black ground, these stripes being smooth and regularly curved and about one-third or one-fourth the width of the black interspaces; each pair forms on the shaft a well-defined angle. The rump is similarly marked, but both the white stripes and the black interspaces are wider than on the back and the white stripes are oblique. On the wing-coverts the white stripes are only about one-fifth the width of the black interspaces. The wing-feathers are black narrowly barred with white. The middle tail-feathers are white on the inner web and at the tip of the outer. The remainder of the feather is barred with white. The other tail-feathers are barred with white, the bars becoming progressively finer, more broken, and longitudinally disposed as the outermost feather is approached. The lower

plumage is black, the feathers at the side of the breast being partly white and partly a mixture of black and white. Legs coral-red.

Wing 10·2 inches, tail 17.

The only male of this species that I have seen was procured by Major W. G. Nisbett some years ago at Puntum, eight miles east of Sadone in the Myitkyina District, Burma, at an elevation between 6000 and 7000 feet. It is deposited in the Natural History Museum, South Kensington, and I name it after Mr. W. R. Ogilvie-Grant.

Gennæus mearsi, sp. n.

♂.—The feathers of the rump fringed with a band of white at the tip. With this exception the whole plumage is black, glossed with purplish blue, more richly so on the upper part of the body.

This species differs from the other species of black-breasted silver-pheasants, with white fringes to the rump-feathers, by having the whole rump glossed with bright blue, this gloss becoming more intense near the white fringe and tending to form a bar or band in front of the fringe.

This species was sent me almost at the same time by Major A. Mears, of the Survey Department, from Sylhet, and by Mr. A. C. Bateman from the Kamaing subdivision of the Myitkyina District, Burma.

I have also seen specimens from the North Khasi Hills, Burra bazaar in Manipur, and Commillah in Tippera, and quite recently from Goalpara in Assam.

I name this very distinct and handsome species after Major A. Mears.

XXII.—*On the Wallabies usually referred to Macropus agilis*, Gould. By ERNST SCHWARZ.

IN examining the collection of *Macropus agilis* in the British Museum, I have come to the conclusion that there must be several subspecies, a fact which is very likely, as the species has a wide range all over the northern part of Australia and southern New Guinea. Three of them have received names, while a fourth is undescribed. All the three described forms were united by Thomas in the 'Catalogue.' The British Museum now possessing a large

series of specimens from different localities, I think it advisable to admit the following subspecies :—

1. *Macropus agilis*, Gould.

Macropus binoe, Gould, P. Z. S. 1842, p. 58.

Dorcopsis ? *aurantiacus*, W. & N. C. Rothsch. Nov. Zool. v. p. 513 (1898).

General appearance dull sandy, indistinctly mixed with dark brown. Limbs not much paler than body, brownish grey, darker towards the toes. Markings rather indistinct. Hairs of the hip-stripe reddish yellow with white tips. Under surface of body white, the hairs having sandy bases.

Hab. Arnhem Land, Northern Territory of South Australia.

I am quite unable to distinguish from this form *Dorcopsis aurantiacus*, which resembles it in the dull sandy colouring, and has reversed the hairs between the ears like *M. agilis*, but not on the back like true *Dorcopsis*.

2. *Macropus agilis papuanus* (Ptrs. & Doria).

Macropus papuanus, Ptrs. & Dor. Ann. Mus. Genov. iii. p. 544 (1875).

Macropus papuensis, Schl. P. Z. S. 1875, p. 532.

Halmaturus crassipes, Rams. Proc. Linn. Soc. N.S.W. i. p. 162 (1876).

Macropus agilis, Thos. Cat. Mars. Mon. Brit. Mus. pp. 42, 43 (1888).

Upper side dark brownish yellow, the hairs being annulated with dark yellow and black, often having dark tips. Nape of the neck a little lighter. Limbs whitish yellow, darker towards the toes. Hairs of the sides of the body with reddish-brown bases and white tips. Markings prominent, especially the hip-stripe. Under surface of body white, the hairs being so almost to their bases.

Hab. Southern New Guinea.

This is a rather dark form with prominent markings.

3. *Macropus agilis jardinei* (De Vis).

Halmaturus jardinei, De Vis, Proc. Roy. Soc. Queensl. i. p. 169 (1884).

Macropus agilis, Thos. Cat. Mars. Mon. Brit. Mus. pp. 42, 43 (1886).

Upper side light yellowish sandy, distinctly speckled with black, the hairs sometimes with short dark tips. Nape of the neck brighter coloured, golden yellow, and less speckled. Limbs white, extreme tips of the toes dark brown. Markings

very prominent, especially the pure white cheek-stripe and the hip-stripe. Chest pure white, belly yellowish.

Hab. Northern Queensland.

In the distinctness of the markings and the speckling this form somewhat approaches the New Guinea form, from which it is at once distinguishable by the light colour of the body. The British Museum possesses a large series of specimens from Inkerman, North Queensland, referred to by Thomas and Dollman (P. Z. S. 1908, p. 793) as *M. agilis*.

4. *Macropus agilis aurescens*, subsp. n.

Characterized by the pale reddish sandy upper side, and the almost entire absence of dark speckling in the adult (not in the young). Nape of neck not lighter than back; sides of body slightly paler. Limbs yellowish. Markings of face not very prominent; hip-stripe rather distinct, yellowish white. Hairs of under surface white with narrow yellowish sandy bases.

Hab. N.W. Australia. (Specimens from Fitzroy River and Grant Range examined.)

Type. B.M. O. 6. 1. 5. Old ♂. J. T. Tunney coll. Fitzroy River, W. Kimberley.

Dimensions of type (measured in the skin):—

Head and body 1050 mm.; tail 710; hind foot 240; ear 69.

Skull: basal length 141; greatest breadth 78; palatal length 96; facial index 268; palatal foramina 6·2; length of the upper tooth-row from front of "secator" to back of last molar 40; length of "secator" 9.

This new form is most nearly allied to *M. agilis*, Gould, but differs in the brighter colouring of the upper side and the almost entire absence of dark hairs.

The young of all these forms differ from the adult in being darker, rather more reddish sandy in colour, more distinctly suffused with black, having longer fur and less prominent markings. The difference in size between the adult male and female of these wallabies is noteworthy, the old male being rather larger than the females of the different wallaroos (*M. robustus*). Certainly it is the largest of all the wallabies; the female, on the contrary, is considerably smaller.

I am unable to find any skull-character separating the different subspecies. There is a certain amount of individual variation in the skulls, but no subspecific features are developed.

XXIII.—New Pterasteridæ from the North Pacific.

By WALTER K. FISHER, Stanford University, California.

THE new species of *Pteraster* will be rendered more intelligible if contrasted with known forms in the following synopsis. The species mentioned are not all that occur in the region of the North Pacific, but include most of the 5-rayed forms. These will be fully figured and described in a later publication.

PTERASTER.

- a. Form stellate; R exceeding $1.8r$, usually $2r$ or more.
 - b. Tube-feet in 2 series; supradorsal membrane with spiny spicules; oral spines webbed; superoral spine stout.
 - c. $R=2$ to $2.5r$; adambulacral comb with more than 5 spines; oral spines 6 to 8; superoral spine cylindrical, not 3-edged; paxilla stalk low, with 3 to 5 spines . . . *militaris* (Müller).
 - cc. $R=1.87r$; adambulacral comb with 5 spines; oral spines 5; superoral very large, 3-edged; paxilla stalk high, with 6 spines . . . *trigonodon*, sp. n.
- bb. Tube-feet crowded, in 4 series, at least proximally; supradorsal membrane either without deposits or with a very few simple rods; oral spines partly or wholly webbed; superoral spine slender.
 - c. $R=2r$; adambulacral comb of 3 or 4 spines; oral spines 4; no small lateral pockets back of aperture papillæ; no deposits in supradorsal membrane; paxilla spines usually 2, longer; spiracula present . . . *jordani*, Fisher.
 - cc. $R=1.8$ to $2.5r$; adambulacral comb of 5 spines proximally; oral spines 5; small shallow pockets just back of aperture papillæ; supradorsal membrane with few scattered simple rods; paxilla spines 3, shorter; spiracula absent . . . *mississippi*, sp. n.
- aa. Form more or less pentagonal; R less than $1.8r$.
 - b. Oral spines 6, free; superoral spine very slender; spiracula very numerous; lateral fringe defining ambitus; no spicules in supradorsal membrane; $R=1.4+r$. . . *coscinopeplus*, sp. n.
 - bb. Oral spines 5 to 7, the entire 10 to 14 united by a continuous membrane; $R=1.3r$; deposits present or absent; abactinal surface swollen and more or less warty in adult.

- c. Paxillæ with high pedicel and 5 to 15 (5 to 7 in Alaskan specimens) spines; superoral spine slender, cylindrical; muscle-bands connecting tips of paxillar spinelets; aperature slits small; oral spines 6 or 7; no deposits in supradorsal membrane; lateral fringe not defining ambitus *pulvillus*, Sars.
- cc. Paxillæ low, with low pedicel and 5-7 short spines; superoral spine with 3 sharp edges; no muscle-bands connecting tips of paxillar spinelets; aperature slits unusually large; oral spines 5; in supradorsal membrane deposits in the form of branched rods; lateral fringe defining ambitus *temnochiton*, sp. n.
- bbb. Oral spines 3, the series independently webbed; abactinal surface not much elevated and not at all warty *multispinus*, Clark.

Pteraster trigonodon, sp. n.

Rays 5. $R=30$ mm., $r=16$ mm., $R=1.87 r$; breadth of ray at base 18 mm. General form stellate with angular interbranchial arcs. Disk moderately high; vertical diameter about two-thirds breadth of ray. Supradorsal membrane thin, without definite reticulations; calcareous deposits abundant, in the form of irregular spiny rods; spiracula numerous, large; pseudopaxillæ with high pedicels and 6 divergent spines; 5 adambulacral and 5 webbed marginal mouth-spines; aperature papilla very broad; superoral spine very large, sharp, and 3-edged; actinolateral membrane narrow, not defining ambitus.

Off Santa Cruz Island, California, 447 to 510 fathoms. Bottom, black mud.

Pteraster marsippus, sp. n.

In general appearance and proportions similar to *jordani*; differs in having 3 shorter paxillar spines, sparse calcareous deposits in the form of simple straight rods of small size in supradorsal membrane, proximally 5 adambulacral spines (far along ray only 4), and especially in having the aperature papilla partially tented over by a membrane passing from one comb to the next, and merging outwardly with the actinolateral membrane. A shallow side pocket opening mesially is thus formed, at the mouth of which is the aperature papilla. No spiracles.

Type. $R=100$ mm., $r=40$ mm., $R=2.5 r$; breadth of ray at base 45 mm.; R varies to $1.8 r$.

Near Attu Island, Aleutians, 135 fathoms. Bottom, coarse pebbles.

Pteraster coscinopephus, sp. n.

Stellato-pentagonal. $R=30$ mm., $r=21$ mm., $R=1.4+r$; breadth of ray, omitting lateral fringe 22 mm., with lateral fringe 25 mm. Supradorsal membrane without special muscle-bands connecting summits of spines, but with a fine reticulation; spiracula very numerous, small; no spicules; paxillæ with high pedicels and 6 to 8 spines; actinolateral membrane very wide, the free border defining entire ambitus; 6 webbed adambulacral spinelets; 1 very slender superoral spine; 6 slender free marginal mouth-spines.

Off San Diego, California, 339 fathoms. Bottom, mud.

Pteraster temnochiton, sp. n.

Rays 5. $R=21$ mm., $r=16$ mm., $R=1.3+r$; breadth of ray at base, without lateral fringe 9 to 11 mm., with lateral fringe 12 to 12.50 mm. General form stellato-pentagonal; interbranchial arcs shallow; lateral fringe defining ambitus; pseudopaxillæ low, with 5 to 7 spines; no reticulation; groups of spines independent and spaced; scattered branched irregular rods in membrane; adambulacral spines 5 to 4 webbed, the outer standing perpendicular, not subparallel to actinolateral membrane which is wide; apertures long; aperture papillæ slender, sharp, with slightly convex aboral margin; oral spines 5, slender, all 10 united by continuous membrane; superoral spine sharp, 3-edged, much heavier than marginal spines.

Near Attu Island, Aleutians, 135 fathoms. Bottom, coarse pebbles.

HYMENASTER.

Three species occurring off the west coast of North America are contrasted in the following synopsis:—

- | | |
|--|------------------------------|
| a. Adambulacral armature consisting of 1 spinelet; size very large; paxillæ forming special raised areas; spiracula small, in definite circumscribed areas | <i>koehleri</i> , sp. n. |
| aa. Adambulacral armature consisting of more than 1 spinelet; spiracula not in definite circumscribed areas. | |
| b. Median radial paxillæ very much reduced in size, with 1 to 3 basal lobes; 5 rows of paxillæ on ray; adambulacral spinelets 2 or 3 | <i>perissonotus</i> , sp. n. |

- bb. Median radial paxillæ not greatly reduced in size, with 4 basal lobes; 9 rows of paxillæ along ray; very numerous small spiracula; adambulacral spinelets 4 or 5. *quadriscopinosus*, [Fisher.]

Hymenaster koehleri, sp. n.

Very near to *H. nobilis*, Wyville Thomson, which it resembles in general appearance, number and arrangement of paxillar spines and adambulacral spines, but from which it differs in the following details:—spiracula in very definite circumscribed areas, not confluent between the paxillar crowns; the regular transverse spiracular areas of interbrachial web of *nobilis* absent or only indicated irregularly toward ends of rays; replaced proximally by detached scattered small spiracular areas; furrow spinelet much shorter than segmental papilla; oral spines short (half length of interradial suture, or less). $R=100$ mm., $r=70$ mm., $R=1.4 r$.

Bering Sea, south of Pribilof Islands, 1771 fathoms. Bottom, blue ooze.

Named after Dr. R. Koehler.

Hymenaster perissonotus, sp. n.

General form depressed, nearly pentagonal, with subplane abactinal surface and extensive interradial webs supported by actinolateral spines, which are conspicuously heavier beyond middle of ray. Paxillar area not conspicuously raised. Marginal paxillæ conspicuously larger than the 3 series of abactinal, the radial being very short and, distally, rudimentary. Supradorsal membrane close to abactinal wall along median radial area. Spiracula large, scattered, fairly, but not very, numerous; membrane with very numerous criss-crossing muscle-fibres, which radiate from tips of delicate paxilla spinelets; usually 3 or 4 of these to a paxilla; points of spinelets uniformly spaced on supradorsal membrane, and individual paxillæ not distinguishable. Adambulacral spinelets 2 or less often 3; oral spines 5 or 6, rarely 7, superoral spines 1 or 2; aperture papillæ large, ovate. $R=70$ mm., $r=50$ mm., $R=1.4 r$.

Off San Diego, California, 984 fathoms. Bottom, grey mud. Ranges to Bering Sea.

XXIV.—*New Genera of Starfishes.*

By WALTER K. FISHER, Stanford University, California.

THE following genera will be described in detail and figured in an extensive report on the Asteroidea of the North Pacific, now in preparation.

THRISACANTHIAS, gen. nov.

Astropectinidæ near *Persephonaster*, Alcock, but differing in the arrangement of gonads, which are not confined to the interradii, but extend for a short distance on either side along ray as a number of distinct tufts depending from the genital stolon; adambulacral plates with 1 or 2 enlarged actinal spines; disk of medium size, depressed, rays long; abactinal surface with true paxillæ arranged in regular oblique transverse rows; no enlarged radial series; papulæ all over abactinal surface, except at tip of ray; actinal intermediate plates extending far along ray; interradial areas rather small; spiniform fascicular pedicellariæ on marginals; anus present; madreporic body large, not hidden.

Type, *Persephonaster penicillatus*, Fisher, Bull. Bureau of Fisheries, 1904, xxiv. 1905, p. 297. Off Los Coronados Islands, Lower California, 530 fathoms.

GEPHYREASTER, gen. nov.

Mimasterinæ related to *Mimaster*, Sladen, but differing in having stout tabulate paxillæ with strongly stellate bases by which the plates overlap; in the character of actinal intermediate plates, which, instead of bearing small tufts of spines forming spaced paxillæ, are densely covered with spinelets; in the armature of the mouth-plates, which have a peculiar angular marginal series situated between peristome and superficies of plate on inner end; superambulacral plates present. Marginal plates, adambulacral plates, and armature similar to those of *Mimaster*, the first without enlarged spinules.

Type, *Mimaster swifti*, Fisher, Bull. Bureau of Fisheries, 1904, xxiv. 1905, p. 301. Stephens Passage, Alaska, 188–131 fathoms.

This genus is intermediate in many respects between *Mimaster* and *Pseudarchaster*, but is nearer to the former.

SPHÆRIODISCUS, gen. nov.

Goniasterinæ differing from *Pentagonaster*, Gray (type, *P. pulchellus*), in having the abactinal and actinal plates

wholly granulated; in having not the last but the penultimate or antepenultimate marginals enlarged; in having marginals with spaced granules. The abactinal plates are flat-topped and slightly tubulate on radial areas; the actinals are flat, never convex.

Type, *Stephanaster bourgeti*, Perrier, Expéd. Scientif. du Travailleur et du Talisman, 1894, p. 403, pl. 26. fig. 1.

Pentagonaster as here used includes a small group of southern species of which *P. pulchellus* is the type. *Stephanaster*, Ayres, type *S. elegans*, Ayres (= *P. pulchellus*), is strictly a synonym of *Pentagonaster* in its narrowest sense. *Sphaeriodiscus* includes also *Pentagonaster ammophilus*, Fisher, Hawaiian Islands.

Pentagonaster differs from *Goniaster* (type *Asterias tessellata*, Lamarck = *Goniaster cuspidatus*, Gray) in lacking abactinal tubercles; in having the last marginal plate of both series enlarged; in lacking abactinal secondary ossicles, and numerous papular pores separated by intermediate granules between the dorsal plates of papular areas; in having abactinal and actinal intermediate plates free from granules except for a marginal series of granules.

Pentagonaster is distinguished from *Tosia*, Gray (type *T. australis*, Gray), by the enlarged distal marginal of both series (if a marginal is enlarged in *Tosia* it is the last superomarginal only); in the character of the pedicellariæ, which have narrow spatulate jaws (as in *Goniaster*); in *Tosia* they are low, bivalved, and wider than high, or are absent altogether.

Tosia, as here limited, includes a few southern species—not *granularis*. *Ceramaster*, Verrill (type *C. granularis*), and *Plinthaster*, Verrill (type *P. perrieri*), I regard as quite distinct genera. *Pyrenaster*, Verrill (type *P. dentatus*, Perrier, 1884), according to the testimony of the type specimen, which I have examined, is synonymous with *Plinthaster*. If there is to be any uniting of genera it should be *Goniaster*, *Pentagonaster*, and *Tosia*, decidedly not *Tosia* with *Ceramaster* or with *Plinthaster*.

HETEROZONIAS, gen. nov.

Solasteridæ with a wide-meshed abactinal skeleton, and small pseudopaxillæ like *Solaster*, but differing from that genus in having a complete series of actinal intermediate plates to tip of ray and in the arrangement of marginal paxillæ, which consist of transversely oriented prominent inferomarginals alternating with longitudinally oriented less

prominent superomarginals, all in a single linear series. Adambulacral armature as in *Solaster*. Papulæ numerous and prominent.

Type, *Crossaster alternatus*, Fisher, Proc. Washington Acad. Sciences, viii. 1906, p. 131. Santa Barbara Islands, Cal., 414 fathoms.

XXV.—On a Collection of Mammals made by Mr. S. A. Neave, during his Expedition in Northern Rhodesia. By GUY DOLLMAN.

(Published by permission of the Trustees of the British Museum.)

THE area in which Mr. Neave collected is situated between Lake Bangweolo and Lake Mweru, bounded on the west by the Luapula River, and on the east by the Melunga Escarpment, extending as far north as the southern end of Lake Tanganyika and as far south as Mpika. No collection of mammals of any importance has ever been received from this district before, and therefore it is not surprising to find that some of the specimens represent new and hitherto undescribed forms. The mammalian fauna of this area would appear to be very similar to that of North Nyasaland, and though a few of the species show a distinct relationship with the West African fauna, the majority of forms are East African. The mammals of the Kalungwisi and Chambezi Rivers appear very much the same as those that occur on the Nyika Plateau, mixed with a sprinkling of South Nyasa forms, such as the small Zomba dormouse, *Graphiurus johnstoni*, Thos., a specimen of which Mr. Neave obtained from the Chambezi River District. Some of the species would appear to indicate a relationship with the Tanganyika and Uganda faunæ. Thus we find in the collection both the Marungu dormouse *Graphiurus microtis*, Noack, and the East African *Mus jacksoni*, de Wint.

Of the novelties, the Shrews are perhaps the most interesting. One of the forms, *Crocidura luna*, was obtained by Mr. Neave during his earlier expedition in Katanga. Since my paper on the Katanga mammals*, the series of Central and East African *Crocidura* in the British Museum collection has been considerably increased, and it is now evident that these Katanga specimens ought to be considered as

* Ann. & Mag. Nat. Hist. (8) iii. p. 350 (1909).

representing a distinct species. The series of *Lophuromys* from Mporokoso would appear to be new, being unlike any of the East or West African forms at present known. This species was also represented in the Katanga collection, and it is one of these Congo specimens that has been chosen as the type.

In addition to the descriptions of the new forms, a complete list of all the mammals obtained by Mr. Neave in Northern Rhodesia is here given, as so many of the species are of interest from a distributional point of view.

1. *Galago crassicaudatus*, E. Geoff.

♂. 172. Kalungwisi River.

2. *Galago nyosæ*, Elliot.

♂. 173. Kalungwisi Valley.

It is interesting to find this rare lemur occurring in Northern Rhodesia, the type, the only other specimen at present known, coming from Southern Nyasa.

3. *Scotophilus viridis damarensis*, Thos.

♂. 104. Lundazi River, Loangwa Valley.

4. *Scoteinus schlieffeni*, Peters.

♀. 147. Lofu River, south of Lake Tanganyika.

♂. 174. Kalungwisi Valley.

♀. 111. Upper Loangwa Valley.

5. *Pipistrellus nanus*, Peters.

♂. 144. Upper Kalungwisi River.

♀. 179. Edge of Chimpili Plateau.

♂. 143. Luwingu, Chimpili Plateau.

♀. 192. Loangwa River.

♂. 102. Loangwa Valley.

6. *Nasilio brachyurus*, B. du Bocage.

♂. 184. East of Lake Bangweolo.

♀. 164. Kalungwisi Valley.

These specimens would appear to belong to the West African species, *N. brachyurus*, and not to the South African form, *N. brachyrhynchus*, Smith. In Mr. Neave's last collection from Katanga the two species were both represented, apparently living side by side in the same locality.

7. *Crocidura neavei*, Wrought.

♂. 166. Kalungwisi River.

C. neavei was founded by Wroughton on a single specimen contained in the 1905 Neave Collection from the Ndola District, the type locality being the Kafue River.

8. *Crocidura luna*, sp. n.

♂. 70; ♀. 71. Bunkeya River, Katanga, Congo.

♂. 94. Lufupa River, Katanga, Congo.

Similar in size to *Crocidura hindei*, Thos., but grey in colour instead of brownish red.

Tail rather long, otherwise proportions as in *C. hindei*. Fur of medium length, measuring about 6 mm. in length on back. General colour of upper surface smoke-grey (between slate-grey no. 1 and otter-brown no. 1, 'Repertoire de Couleurs'), rather browner on the back, paling to greyish brown on the sides. Individual hairs of back slaty grey at base, turning greyish white towards the apical portion, tips brown. Backs of hands and feet thinly covered with short greyish-white hairs. Under surface of body slaty grey, washed over with silvery white. Individual hairs of belly slate-grey with greyish-white tips. Tail thinly covered with short grey hairs; the longer hairs fairly numerous and evenly scattered throughout the basal half.

Skull with rather a broad cranial region.

Dimensions of the type (measured in the flesh):—

Head and body 88 mm.; tail 60; hind foot 15; ear 12.

Skull: greatest length 24.5; basal length 21.3; greatest breadth across brain-case 10.5; greatest breadth across maxillary region 7.5; palatal length 10.5; length of upper tooth-row from front of first incisor to back of last molar 11.

Hab. Bunkeya River, Katanga, Congo, altitude 3400 feet.

Type. Adult male. B.M. no. 9. 1. 3. 3. Original number 70. Collected on August 31st, 1907.

This species is easily distinguished from its near allies by the cold grey colour of the fur, and the broad, rather flat skull.

9. *Crocidura electa*, sp. n.

♂. 150. Kamtoby, south of Lake Tanganyika.

♀. 152. Lofu Valley, Tanganyika Plateau.

Allied to the foregoing species, but rather smaller in size and with a shorter tail.

Tail rather short, nearly 10 mm. shorter than that of *C. luna*. General colour of upper surface very much as in *C. luna* (between slate-grey no. 1 and otter-brown no. 1, 'Repertoire de Couleurs'). Sides of head and flanks grey (slate-grey no. 1, 'Repertoire'). Individual hairs of back dark slaty grey at base, paling to greyish white terminally; tips brown. Lower surface of body silvery grey. Hairs of belly dark slate-coloured, with greyish-white tips. Tail very thinly clad with short grey hairs, a few longer hairs present on the basal half, as in *C. luna*.

Skull rather smaller than that of the foregoing species.

Dimensions of the type (measured in the flesh):—

Head and body 78 mm.; tail 47; hind foot 13·5; ear 10.

Skull: greatest length 23·3; basal length 20; greatest breadth across brain-case 10·3; greatest breadth across maxillary region 7·5; palatal length 10; length of upper tooth-row from front of first incisor to back of last molar 10·7.

Hab. Kamtoby, south of Lake Tanganyika. Altitude 4500 feet.

Type. Adult male. B.M. no. 9.12.4.15. Original number 150. Collected on August 21st, 1908.

This well-marked species is readily recognized by its small size, and although closely resembling *C. luna* in colour, it is distinguished at once by the smaller size of the body and proportionally shorter tail.

10. *Crociodura turba*, sp. n.

♂. 141; ♀. 140. Chilui Island, Lake Bangweolo.

♀. 181. Luwingu, between Lakes Bangweolo and Tanganyika.

♂. 178. Machinga Plateau, Kalungwisi District.

Size and general colour of upper surface very much as in *Crociodura fumosa*, Thos., but with a shorter tail, narrower skull, and pure grey-coloured belly.

Fur measuring about 5·5 mm. in length on back. General colour of upper surface dark brown (sepia no. 3, 'Repertoire de Couleurs'), slightly paler on flanks. Individual hairs of back grey with long brown tips. Backs of hands and feet thinly covered with short brownish hairs. Under surface of body silvery grey. Hairs of belly dark slate-coloured, tips greyish white. Tail covered with short dark hairs, intermingled with which are a number of longer hairs, irregularly scattered throughout the basal two-thirds of the tail.

Skull slender and long, rather narrow across maxillary and cranial regions.

Dimensions of the type (measured in the flesh):—

Head and body 96 mm.; tail 43·5; hind foot 15; ear 10·5.

Skull: greatest length 24; basal length 21; greatest breadth across brain-case 10; greatest breadth across maxillary region 7; palatal length 10; length of upper tooth-row from front of first incisor to back of last molar 10·7.

Hab. Chilui Island, Lake Bangweolo. Altitude 3900 feet.

Type. Adult male. B.M. no. 9. 12. 4. 17. Original number 141. Collected July 7th, 1908.

This shrew, though allied to *C. fumosa*, must be considered specifically distinct on account of its much narrower and longer skull and the pearl-grey coloured under parts.

11. *Crocidura* sp.

♂. 142. Chilui Island, Lake Bangweolo.

A large form apparently allied to the foregoing species. On account of its skull being very imperfect I am unable to definitely determine what species it is most nearly allied to, and until further specimens are available for examination it is impossible to settle the matter satisfactorily.

12. *Aonyx maculicollis*, Licht.

♂. 183. East of Lake Bangweolo.

Unlike the South African specimens, this otter has practically no white markings on the chest and throat. At present there is not material enough to hand to decide whether this character is of any specific value.

13. *Crossarchus fasciatus*, Desm.

♂. 175. Kalungwisi River.

14. *Helogale varia*, Thos.

♂. 176. Kalungwisi River.

15. *Canis lateralis*, Sclat.

♂. 128. Chambezi River.

16. *Paraxerus cepapi quotus*, Wrought.

♂. 101. Loangwa Valley.

17. *Heliosciurus rhodesiæ*, Wrought.

- ♂. 123, 124; ♀. 121. Chambezi River.
 ♂. 171. Kalungwisi River.
 ♂. 182. Luena River.

18. *Graphiurus microtis*, Noack.

- ♀. 157. Lofu Valley, Tanganyika Plateau.
 ♀. 177. Machinga Plateau, Kalungwisi District.
 ♀. 190. Mpika Plateau.

These specimens would appear to represent Noack's *G. microtis*, though they are all rather larger in size than the dimensions given in his description. As however the type locality of Noack's species was Marungu, there seems to be no reason why these Kalungwisi and Lofu specimens should be regarded as other than true *microtis*.

19. *Graphiurus johnstoni*, Thos.

- ♀. 127. Chambezi River.

20. *Tatera liodon*, Thos.

- ♀. 145. Lofu River, Tanganyika Plateau.
 ♀. 129. Chambezi River.
 ♂. 188; ♀. 186. East of Lake Bangweolo.

21. *Tatera nyasæ*, Wrought.

- ♀. 106, 107, 109. Upper Loangwa Valley.
 ♀. 112. Mirongo, Loangwa River.

22. *Otomys irroratus nyikæ*, Wrought.

- ♀. 139. Chirui Island, Lake Bangweolo.

23. *Dendromus whytei*, Wrought.

- ♀. 118. Chambezi Valley.

24. *Steatomys pratensis*, Peters.

- ♂. 185. East of Lake Bangweolo.
 ♀. 110. Upper Loangwa Valley.

25. *Mus rattus*, L.

- ♂. 131; ♀. 130. Luena, Bangweolo Basin.

26. *Mus chrysophilus*, de Wint.

- ♂. 146. Lofu River, Tanganyika Plateau.
♂. 113. Chinsali, Loangwa River.
♀. 103. Lundazi River, North Loangwa Valley.

27. *Mus walambæ*, Wrought.

- ♂. 120, 122, 125, 126. Chambezi River.
♂. 169. Kalungwisi River.
♀. 133. Edge of Chimpili Plateau.
♀. 132. Upper Luansenshi River.

28. *Mus coucha*, Smith.

- ♂. 138. Chishi Island, Lake Bangweolo.
♀. 189. Lower Chambezi River.

29. *Mus jacksoni*, de Wint.

- ♂. 163. Mporokoso, south of Lake Tanganyika.

30. *Thamnomys surdaster*, Thos. & Wrought.

- ♂. 153, 154, 156; ♀. 155. Lofu River, south end of Lake Tanganyika.

31. *Leggada triton murilla*, Thos.

- ♂. 165. Kalungwisi Valley.

32. *Leggada bella*, Thos.

- ♀. 137. Chishi Island, Lake Bangweolo.

33. *Lophuromys rita*, sp. n.

- ♂. 159, 160, 161; ♀. 162. Mporokoso, south of Lake Tanganyika.

♂. 86. Lufupa River, Katanga, Congo.

Allied to *L. zena*, Dollm., but redder in colour and rather more finely speckled.

Size and general proportions as in *L. zena*. Hair of the usual *Lophuromys* type, rather long on the back, measuring about 13 mm. in length. General colour of back reddish brown (between warm sepia no. 1 and burnt umber no. 2, 'Repertoire de Couleurs'), speckled all over with pinkish buff. Individual hairs of back reddish orange at base, gradually darkening towards apical portion to a brownish

red; subterminal rings orange, tips dark brown. Flanks rather paler than back. Backs of hands and feet brown, metatarsal region partially buffy. Under surface of body cinnamon-grey (snuff-brown no. 1, 'Repertoire'); individual hairs of belly buff-coloured at base, terminal halves grey, tips cinnamon. Chest brighter in colour (buff no. 1, 'Repertoire'), hairs without grey bases. Upper side of tail thinly covered with short dark brown hairs; lower surface very similar, hairs a little greyer.

Skull like that of *L. zena*; posterior nares rather broader.

Dimensions of the type (measured in the flesh):—

Head and body 107·5 mm.; tail 68; hind foot 21; ear 16.

Skull: condylo-basal length 29; basal length 26; condylo-basilar length 27; basilar length 24; zygomatic breadth 15; palatal length 14·6; palatilar length 13; greatest length of nasals 12; length of palatal foramina 6·3; length of upper tooth-row 5.

Hab. Lufupa River, Katanga, Congo. Altitude 4000 feet.

Type. Adult male. B.M. no. 9. 1. 3. 36. Original number 86. Collected on October 2nd, 1907.

In addition to the type Mr. Neave collected four specimens of *Lophuromys* at Mporokoso, south of Lake Tanganyika, all four being very similar in colour to the Katanga specimen.

This species would appear to be more nearly allied to the Aberdare form, *L. zena*, Dollm., than to *L. aquilus*, True, from which it is readily distinguished by the entire upper surface being finely speckled with pinkish buff. *L. zena* is rather more coarsely speckled, and the general colour of the upper and lower surfaces a good deal paler.

It is probable that when this genus is more fully known it may be thought necessary to reduce this form to subspecific rank. For the present, however, it is more convenient to regard it as a distinct species, since the relations of the other forms are not yet satisfactorily determined.

34. *Saccostomus campestris*, Peters.

♀. 187. East shore of Lake Bangweolo.

35. *Dasymys bentleyæ*, Thos.

♀. 180. Luwingu, north-east of Lake Bangweolo.

36. *Arvicanthis pulchellus*, Gray.

151. ♀. Lofu River, Tanganyika Plateau.

37. *Pelomys fallax*, Peters.

♀. 167, 168, 170. Kalungwisi River.

38. *Georychus mellandi*, Thos.

♂. 119. Chambezi Valley.

39. *Georychus amatus*, Wrought.

♂. 114, 116; ♀. 115, 117. Chambezi Valley.

♂. 134. Edge of Chimpili Plateau.

♂. 148, 149. Lofu River, south of Lake Tanganyika.

XXVI.—On Two new Species of Wood-boring Crustacea from Christmas Island. By W. T. CALMAN, D.Sc.

(Published by permission of the Trustees of the British Museum.)

[Plate V.]

AMONG the Crustacea collected by Dr. C. W. Andrews, F.R.S., on his visit to Christmas Island in 1908, and presented to the British Museum by Sir John Murray, K.C.B., F.R.S., are two species, an Amphipod and an Isopod, which were found boring into the piles of the pier at Flying-Fish Cove. It is worthy of note that, although both species are apparently undescribed, they belong to the same genera, *Chelura* and *Limnoria*, as the two species that are associated together in destroying submarine timber on our own coasts.

The aberrant Amphipod family Cheluridæ has hitherto comprised only a single species, the well-known *Chelura terebrans* of the North Atlantic and adjoining seas, and the discovery of a second species in the Indian Ocean is therefore of some interest.

Of the Isopod genus *Limnoria* five species have already been described. *L. pfefferi*, Stebbing, the only one known in tropical seas, comes from the island of Minikoi, but it appears to be very distinct from the species described below.

Order AMPHIPODA.

Suborder GAMMARIDEA.

Family Cheluridæ.

All necessary references to the literature of the family and of its type species will be found in Mr. Stebbing's invaluable *Ann. & Mag. N. Hist.* Ser. 8. Vol. v. 13

revision of the Gammaridea ('Das Tierreich,' Lief. 21, 1906, p. 693). Some modification of the definitions given in that work is necessary to admit the species described below. In the definition of the family the words "Pleopods with peduncle produced on the inner side" must be omitted. In that of the genus "pleon segments 1 and 2 very short" and "antenna 1 short" are no longer applicable; the inner plate of "maxilla 1" may have nine setæ and that of "maxilla 2" four setæ on the inner margin; the "2nd joint little expanded" does apply to the fifth peræopods, and the inner ramus of "uropod 3" is absent in the new species.

Chelura insulæ, sp. n. (Pl. V. figs. 1-6.)

Description of ovigerous female.—Length of body about 5 mm.; greatest breadth about .9 mm.

General form of the body (fig. 1) more slender than in *C. terebrans*, the dorsal surface with more numerous scattered setæ. Third pleon somite with three subequal tubercles on its hind margin (fig. 2); the following segment (fourth to sixth somites fused) about one-fifth of total length of body. Fifth and sixth side-plates with very small anterior lobe.

Antennule (fig. 1) nearly two-fifths as long as body; flagellum sparsely setose, little longer than last segment of peduncle, with five segments; accessory flagellum unsegmented, about half as long as first segment of flagellum.

Antenna (fig. 1) about half as long as body; last segment of peduncle subequal to penultimate and longer than antepenultimate, less densely setose than the flagellum; flagellum more than three times as long as broad, with indications of segmentation becoming more distinct distally.

Mouth-parts closely resembling those of *C. terebrans*, but the mandibular palp is longer and has a relatively larger proximal segment with a group of setæ at its distal end; inner plate of maxillula broader, with about nine setæ; inner plate of maxilla with four setæ below the longer one which marks the distal limit of the inner edge.

First gnathopods (fig. 3) very large, about two-fifths of length of body; breadth of propodus (palm) two-thirds of its length, palmar edge sloping backwards to about half the length of the propodus, irregularly dentate and defined by a strong tooth; dactylus stout, longer than the palmar edge. Second gnathopods (fig. 4) slender; carpus about as long as propodus, the latter about four times as long as broad, narrowing distally, minutely subchelate; all the segments carrying numerous very long setæ. Peræopods (fig. 1) with

the basipodites much more expanded than in *C. terebrans*, that of the last pair about two-thirds as broad as long; distal segments of last three pairs flattened, the propodus with a row of strong spines on its hinder edge.

Pleopods (fig. 5) with the peduncle flattened, but not produced on the inner side. First uropods (fig. 1) with peduncle nearly three times as long as endopod, which is about one-third longer but not broader than the exopod; both rami armed with stout spines. Peduncle of second uropods (figs. 1 & 2) nearly twice as long as broad, its strongly serrated upper (or outer) edge only slightly curved, not produced as in *C. terebrans* into a rounded lobe. Third uropods (figs. 1 & 2) uniramous, the endopod wanting; exopod about twice as long as broad.

Telson (fig. 2) slightly concave, not noticeably carinate, on the dorsal surface, its breadth two-thirds of its length, with a few serrations at the acute point.

The eggs are large (about .6 mm. in length) and not more than three were found together in the marsupium. Some ovigerous individuals were found of which the body-length did not much exceed 3 mm., and in each of these the marsupium contained only a single egg. In a small series of *C. terebrans* examined for the purpose of comparison the number of eggs carried by a single female varied from three to eight.

Adult male (fig. 6).—Length of body about 7 mm.; greatest breadth about 1.1 mm.

Third pleon somite with median tubercle more acute but no larger than in female; lateral tubercles broadened, with deeply concave posterior margin and prominent corners. Proportions of antennules and antennæ much as in female except that the antennal flagellum is more than four times as long as broad.

First gnathopods (fig. 6) larger than in female, about three-sevenths of length of body; propodus (palm) very massive, with two large unequal teeth about the middle of its palmar edge.

Peduncle of second uropods (fig. 6) more than twice as long as wide, the setæ on its upper edge longer and more numerous than in the female. Exopod of third uropods (fig. 6) three times as long as broad, with a thick brush of very long setæ on its lower surface.

Remarks.—Of the numerous characters in which this species differs from *C. terebrans* the great size of the anterior gnathopods, the reduction of the median tooth on the third pleon segment, the much longer antennules and antennæ, and

the brush of hairs on the third uropods of the male are the most conspicuous. The first of these and the absence of the endopod of the third uropods are characters equivalent to some that are used in other families of Gammaridea for the separation of genera ; but there is as yet no necessity to give them generic value in this case.

Order ISOPODA.

Suborder FLABELLIFERA.

Family Sphæromidæ.

I follow Hansen (Quart. Journ. Micr. Sci. (n. s.) xlix. p. 98, 1905) in placing *Limnoria* in a subfamily, Limnoriinæ, of the Sphæromidæ instead of in a separate family. A trivial modification in Hansen's definition of the subfamily is required by the fact that the fifth pair of pleopods in the new species are not entirely without marginal setæ.

Limnoria andrewsi, sp. n. (Pl. V. figs. 7-14.)

Description of female (not ovigerous).—Length of body when straightened out about 2·0 mm. ; breadth ·65 mm.

General form of body (fig. 7) narrower than in *L. lignorum* or *L. pfefferi*. The first free thoracic somite has only a shallow transverse depression dorsally. The fifth abdominal somite is almost as long, in the middle line, as the telsonic segment ; the latter has a slight median elevation, indistinctly bilobed, anteriorly, and its posterior margin is less evenly rounded than in *L. lignorum* and *L. pfefferi*. The whole dorsal surface is beset with short setæ.

The antennules (fig. 8) have the second segment nearly twice as long as broad and longer than the third. A minute nodule (marked * in figure) bearing two setæ on the distal end of the third segment may perhaps represent a vestige of the accessory (inner) flagellum. In the antennæ (fig. 9) the last segment of the peduncle is nearly twice as long as the preceding.

The palp of the mandible (fig. 10) is more slender than in any of the described species ; the second segment about one-third longer than the first and nearly three times as long as the third.

The epipod of the maxilliped (fig. 11) extends as far as the distal end of the ischium ; it is about three times as long as wide, with a bluntly pointed apex.

The first gnathopod (fig. 12) resembles that of *L. lig-*

norum, but the accessory spine on the inner side of the dactylus (fig. 13) is tridentate and there is a large spine with a single row of comb-like teeth springing from the distal end of the propodus in addition to the smaller doubly pectinate spine present in *L. lignorum*. In the succeeding limbs the accessory spine is simple and there are no pectinate spines on the propodus. None of the thoracic limbs have the distal segments provided with tubercles or blunt spines. The last pair are less elongated than in *L. lignorum* or *L. pfefferi*.

The endopod of the pleopods is narrowly oblong only in the first pair; in the following pairs it becomes wider than the exopod, and in the last pair, where the exopod is devoid of setæ, the endopod has two short plumose setæ on its distal edge.

The exopod of the uropods (fig. 14) without its terminal spine is about as long as the outer edge of the peduncle, and the endopod is about half as long again; both rami are slightly curved.

The dorsal surface is coloured by a varying amount of black pigment forming an elegant and complex pattern.

There are no ovigerous specimens in the collection and none of those dissected proved to be males.

Remarks.—Mr. Stebbing gave, in 1904 (Gardiner's 'Fauna Maldive and Laccadive Archip.' ii. (3) p. 714), a key to the four species of *Limnoria* then known. The species described above falls into the third section of this key, having the epipod of the maxillipeds longer than the basis, the exopodite of the uropods not unguiform, and the rami of the uropods not both very small. The two species in this section are *L. segnis*, Chilton, and *L. pfefferi*, Stebbing; from the first of these the present species differs in having the mandibular palp well developed and consisting of three segments; from the second it differs in having the epipod of the maxillipeds much more than twice as long as wide. From all four species it is separated by the shortness of the peduncle of the uropods, which does not exceed the exopod in length; in all the other species it exceeds the exopod and in *L. antarctica* and *L. pfefferi* it is longer than the endopod.

So far as I am aware, the only species added to the genus since the date of Mr. Stebbing's paper is *L. japonica*, described by Miss Richardson (Proc. U.S. Nat. Mus. xxxvii. p. 95, 1909). This species is characterized chiefly by the presence of tubercles and ridges on the posterior part of the body; the exopod of the uropods appears to be unguiform as in *L. lignorum*, but no details are given as to the maxillipeds. A point of some general interest is the presence on the antennule

of the new species of what may be a vestige of the inner flagellum. The only Isopoda in which any trace of this flagellum has been found hitherto are the gigantic *Bathynomus* and the cryptoniscan larvæ of some *Epicaridea*.

EXPLANATION OF PLATE V.

- Fig. 1. *Chelura insulæ*, ovigerous female, from the side.
 Fig. 2. Ditto. Posterior part of body, from above.
 Fig. 3. " Gnathopod of first pair.
 Fig. 4. " Gnathopod of second pair.
 Fig. 5. " Pleopod of second pair.
 Fig. 6. " Adult male, from the side.
 Fig. 7. *Limnoria andrewsi*, female, from above.
 Fig. 8. Ditto. Antennule. * Supposed vestige of inner flagellum.
 Fig. 9. " Antennæ.
 Fig. 10. " Mandible.
 Fig. 11. " Maxilliped.
 Fig. 12. " Gnathopod of first pair.
 Fig. 13. " Terminal part of same, further enlarged.
 Fig. 14. " Uropod.

XXVII.—Notes on the *Choanoflagellate* Genera *Salpingœca* and *Polyœca*, with Description of *Polyœca dumosa*, *sp. n.*

By J. S. DUNKERLY, B.Sc., Assistant in Zoology Department, Birkbeck College, London.

[Plates VI. & VII.]

THE Choanoflagellata have been little studied of late, and after observing several freshwater forms, I spent a month of 1909 at the Plymouth Biological Station, in order to obtain some knowledge of the marine members of the family. I should like here to express my sincere thanks to the British Association for the Advancement of Science for permission to use their table, and also to the staff of the Laboratory for their kind assistance. My work on these forms has received the kindest encouragement and assistance from Professor Minchin, who has allowed me to work at the Lister Institute.

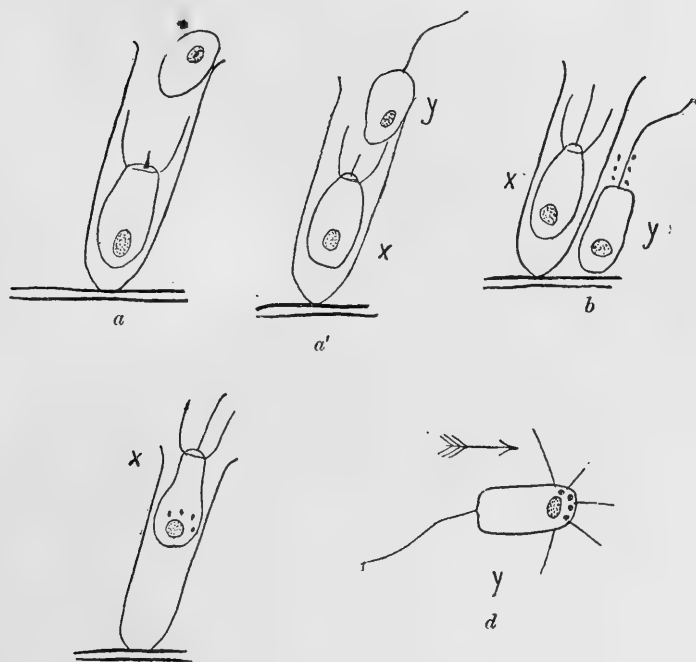
SALPINGŒCA.

Salpingœca was established as a genus by James Clark (1), and Saville Kent discovered a large number of different forms. That all of Saville Kent's so-called species are truly such is more than doubtful: *e. g.*, Francé has pointed out that Kent's figures of *Monosiga ovata* (2, pl. II. fig. 33) and *M. consociata*

(*ibid.* pl. iv. fig. 19) are practically identical. Most of the species of *Salpingoeca* admitted by Francé I have seen; one species, the beautiful *S. ampulla*, had not been seen apparently by Francé, the latest monographer of the group.

The commonest species at Plymouth is *S. vaginicola*, which has a very elongate lorica. In this species, which is large, the blepharoplast, which has been seen in *S. amphoridium* by Burck (5), is distinct in preparations stained with carmalum or iron hæmatoxylin (Pl. VI. figs. 1 & 2). Certain interesting results of division were seen (text-fig. 1, *a-d*) in this

Fig. 1.



Division (late stages) of *S. vaginicola*. In *d* arrow shows direction of movement. (Diagrammatic.)

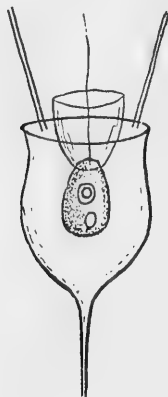
species. At *a'* the two products of division are seen in the same lorica, and it may be noted that the lower individual (*x*) which at this stage possessed collar and flagellum, is situate in the lower portion of the lorica. The upper individual (*y*),

which had one flagellum, but no collar, was seen to move slowly away and to settle down as at *b*. After ten minutes it moved slowly away, with its flagellum trailing as a pulsillum (*d*). At this stage *x* had moved up to near the mouth of its lorica, the customary situation (*c*); apparently the animal descends in its lorica for the purpose of division. The free individual (*y*) was observed for an hour to be moving slowly about with feeble movements of its flagellum. Extremely fine pseudopodia were seen at times to be extruded from the aflagellate region of the body (*d*). These may serve as attaching processes when the animal settles down, but the particular individual was unfortunately lost at this stage.

POLYÆCA.

Polyæca dichotoma (text-fig. 2) was the name given to a species of Choanoflagellata found by Saville Kent in a marine tank at the Crystal Palace in 1874. Since that time it has not been recorded, neither Francé (4) nor Bütschli (3) having

Fig. 2.



Polyæca dichotoma (after Saville Kent).

seen it. Francé admits it as a genus in his monograph (*loc. cit.*), but writes:—"Diese eigentümliche Art, . . . wurde in den letzten 23 Jahren von Niemandem wiedergefunden."

I found a form obviously answering to Kent's description of this genus quite abundant in a tank at Plymouth Marine Biological Station in August 1909, but have not succeeded in finding it in material from outside.

My drawings and preparations show that, in colony formation and in the shape of lorica, the specimens seen by me differ considerably from those shown in the figures of S. Kent. I am reluctant to establish a new species name in this little-known group, but unfortunately S. Kent's specific name of *dichotoma* would be a positive misnomer for this form. It will be seen (Pl. VI. fig. 2) that from one basal individual as many as five daughter individuals may arise. The form of the lorica is very different from that shown in Kent's figures, the base tapering down very gradually; also the body nearly fills the lorica, whereas Kent shows the body as being about one-half the width of the lorica. The stalk of *Polyoeca dichotoma* is shown as branching by Kent. I believe that this was an error of interpretation. Certainly I have never found a stalk branching in my species, although, without careful observation, the crossing of two stalks (Pl. VI. fig. 2) might easily be mistaken for such. Under these circumstances I am compelled to distinguish this species from that of Kent, and, from the bushy form of full-grown colonies, the name *Polyoeca dumosa* would appear to be suitable.

The form is very small, the lorica being $10.5\ \mu$ in length and $4.5\ \mu$ in breadth, while the cell itself is only $6\ \mu$ long and $4\ \mu$ broad. The flagellum is at least twice as long as the cell-body and is generally in movement along its whole length. The collar is usually very well expanded (Pl. VII. figs. 3 & 4). It is worthy of note that in most of the marine forms seen by me the collar was expanded into the cup-shaped form which Kent always depicts. This is not the case with freshwater forms, or rarely so, the collar being in them more cylindrical in shape. Francé, being more familiar with freshwater forms, was led by this fact to remark that "nur in ganz vereinzeltten Fällen ist das Collare tatsächlich glockenförmig," but, in the majority of cases, Kent's figures are probably correct in this respect, as he worked a great deal with marine Choanoflagellata.

The nucleus, not shown in most of Kent's figures of *P. dichotoma*, is seen in preparations stained with carmalum or treated with iodine solution (Pl. VII. figs. 5 & 6). Although very obscure, it can be seen near the base of the flagellum. Like most of the nuclei in Choanoflagellata, it consists of a round evenly staining body, with a central deeply staining karyosome. I have not seen a blepharoplast clearly.

The main interest of this form lies in its faculty for colony formation. Division occurs as described above for *Salpingoeca*, the two resulting cells lying somewhat obliquely in the cell (text-fig. 3). The difference between *Salpingoeca* and

Polyoeca is that the daughter individual in *Polyoeca* erects its lorica on the mouth of the mother individual's lorica, instead of swimming away and settling elsewhere.

The excessively attenuate base of the lorica in *Polyoeca* leads one to imagine that the length of stalk, in this form at least, is due to the gradual increase in area of that part of

Fig. 3.



Fig. 4.

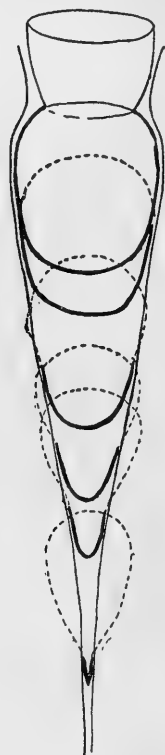


Fig. 3.—Division of *P. dumosa* (late stage).

Fig. 4.—Diagram showing mode of formation of lorica in *P. dumosa*.

the cell which is capable of secreting the material for the formation of the lorica. A diagram (text-fig. 4) shows what may happen in such cases. The successive stages of growth of the cell are shown, and the secreting area in each case is in continuous line, the rest of the cell-outline being dotted. The form of the *P. dumosa* lorica suggests this mode of forma-

tion of the stalk, and on purely *à priori* grounds it would be unlikely for a cell to grow out unprotected on a long stalk, and *then* to form a protective lorica. On the other hand, it is difficult to see how, the lorica being once formed, the stalk could be elongated by a cell situate within the lorica. However, the mode of secretion by similar stalked forms is little understood, but this explanation suggested itself to me after continued comparisons of the younger and older members of a *P. dumosa* colony (Pl. VI. fig. 2, *c* and *d*).

References to Literature.

- (1) JAMES CLARK. "On Spongiæ Ciliatæ." Mem. of Boston Soc. Nat. Hist. vol. i. pt. 3. 1867.
- (2) SAVILLE KENT. Manual of the Infusoria. 1881-82.
- (3) BÜTSCHLI. "Protozoa Flagellata" in Bronn's 'Thierreich,' Bd. i. Abth. 2. 1883-87.
- (4) R. FRANCÉ. Der Organismus der Craspedomonaden. 1897.
- (5) CARL BURCK. "Studien über einige Choanoflagellaten." Arch. f. Protistenkunde, Bd. xvi. Heft 2. 1909.

EXPLANATION OF PLATES VI. & VII.

Fig. 1 a. Salpingœca vaginicola. Flemming—Fe hæmatoxylin. Individual with long lorica.

Fig. 1 b. Ditto. Osmic 4 per cent.—carmalum.

Fig. 2. Polyœca dumosa, sp. n. Colony, showing method of growth.
a, degenerating individual in its lorica; *b*, empty lorica;
c, young individual with short stalk and narrow lorica;
d, older individual with longer stalk and wide lorica.

Fig. 3. Single individual of *P. dumosa*, drawn living. Arrows show direction of current of food-vacuoles.

Fig. 4. Colony of *P. dumosa*, drawn living.

Fig. 5. Part of colony of *P. dumosa*. Flemming—carmalum.

Fig. 6. P. dumosa. Osmic 4 per cent.—iodine.

XXVIII.—Further new African Mammals.

By OLDFIELD THOMAS.

(Published by permission of the Trustees of the British Museum.)

Cercopithecus preussi insularis, subsp. n.

Similar in essential characters to the true Kamerun *C. preussi*, Matsch., but tending to be darker throughout. Back much less rich chestnut, the hairs of this part with their bases blackish slaty for more than half their length, then with dull buffy subterminal rings and broad black tips. In true *preussi* they are light slaty for their basal half (or less), their terminal half tawny tipped with black. Tail with

the chestnut colour scarcely extending on to its base, this being chestnut for about six inches in *preussi*; its median part darker grey than in *preussi*.

Hab. Fernando Po. Type from N. Bantabiri, 1800 m.

Type. Immature female. B.M. no. 4. 7. 1. 5. Original number 165. Collected 9th March, 1904, by E. Seimund. Presented by the Fernando Po Committee. (Selected for type as being a proper specimen with skull and all particulars, but two native skins of adult examples agree with it in every detail of colour.)

A fine specimen of true Kamerun *C. preussi* recently collected by Capt. Boyd Alexander has enabled me to make a comparison of our Fernando Po specimens † with the continental form, and I find there is enough difference to demand their subspecific separation.

Rhinolophus brockmani, sp. n.

A very pale-coloured species, allied to *R. lobatus* and *dobsoni*.

General characters as in *R. dobsoni*; the nose-leaf apparently quite as in that species. Colour remarkably pale, the hairs of the upper surface white with a brown tip about a millimetre in length, and of the under surface wholly white from base to tip.

Skull as compared with that of *R. dobsoni* rather longer and narrower, with a more elongate brain-case. Opening of posterior nares rather broader.

Cheek-teeth markedly smaller, the molars (particularly m^3) narrower, and the inner lobe of m^1 and m^2 smaller, so as to have a larger space between each tooth. Small upper premolar large, in the centre of the unusually extended space between the canine and p^4 , a space double as broad as in *R. dobsoni*. P^4 with its antero-external corner projecting forward in front of the anterior edge of the narrow inner lobe, the latter being in *R. dobsoni* practically the most anterior part of the tooth, no angular external projection being present; inner lobe of the same tooth much narrower than in *R. dobsoni*.

Dimensions of the type (the starred measurements taken in the flesh):—

Forearm 44 mm.

Head and body* 45; tail* 26; ear* 18. Third finger, metacarpus 29; 1st phalanx 14, 2nd phalanx 25; lower leg and foot (c. u.) 27.

† Cf. P. Z. S. 1904, ii. p. 186.

Skull : greatest length 18 ; front of canine to back of m^3 6.6.

Hab. Upper Sheikh, Somaliland. Alt. 4500'.

Type. Adult female. B.M. no. 9.12.17.4. Original number 237. Collected 13th November, 1909, and presented by Dr. R. E. Drake-Brockman. Two specimens.

The most striking character of this bat is its peculiar whitish colour, other members of the group being generally some shade of grey. Unfortunately the colour of the original specimens of its nearest ally *R. dobsoni*, from Kordofan, cannot be determined, but the difference in the skulls and teeth is quite sufficient to separate the two.

A number of *R. acrotis*, Heugl., were obtained at the same time and place.

Erinaceus hindei, sp. n.

Colour and other external characters as in *E. albiventris*.

Skull markedly broader and heavier than in *albiventris*, that of a female fully the length of an adult male *albiventris* and much broader. Zygomata very much more widely expanded, the zygomatic breadth 30 mm. as compared with 27 in the broadest of six examples of *albiventris*. Nasals narrow as in *albiventris*, not so broad as in *sclateri*. Præ-maxillæ more slanted backwards, touching the tips of the frontal processes and shutting off the maxillæ from the nasals ; in *albiventris* there is a naso-maxillary suture about 3.5 mm. in length. Teeth larger and heavier throughout, and the palate broader. Mesopterygoid fossa also decidedly broader.

Dimensions of the type :—

Hind foot 26 mm.

Skull : greatest length 44 ; zygomatic breadth 30 ; nasals 11.5×2.2 ; intertemporal constriction 11.6 ; palatal length 25 ; breadth across palate, including m^1 , 18.2 ; breadth of mesopterygoid fossa 3.5 ; length of upper tooth-row 21.5.

Hab. Kitui, British East Africa. Alt. 3500'. A second specimen from Machakos.

Type. Adult female. B.M. no. 1.5.6.6. Original number 67. Collected 24th January, 1901, and presented by Dr. S. L. Hinde.

This hedgehog is no doubt closely allied to *E. albiventris*, with which it shows all the important structural characters, but may be distinguished by the differences in the skull above described. When males are available for comparison the discrepancy in size will no doubt prove to be greater than now appears.

E. albiventris atratus *, Rhoads, agrees so closely in colour with the Somali *E. sclateri*, Anderson †, that I am tempted to suppose that some error has been made in the examination of its feet, and that it is really synonymous with that species.

Helogale undulata rufula, subsp. n.

A strongly coloured form, the body (above and below) and upperside of tail suffused with, and the face, throat, feet, and underside of tail clear, deep tawny. Back ticked with black and buffy, the underfur brownish grey basally, tawny terminally, thus giving the tawny suffusion to the general colour. Crown not darker than back.

Skull with the teeth markedly larger than in the otherwise somewhat similar *H. macmillani*, Thos.

Dimensions of the type:—

Hind foot 47 mm.

Skull: condylo-basal length 53·5; length of p^4 on outer edge 4·6, greatest diameter 5·9.

Hab. British East Africa. Type from Rogoro, Kikuyu. Mile 346 of the Uganda Railway. Other specimens from Mau Escarpment, Masongoleni, and Voi.

Type. Adult male. B.M. no. O. 1. 3. 3. Collected 23rd July, 1899, and presented by C. S. Betton, Esq.

This *Helogale* is far more deeply tawny throughout than an example from German E. Africa obtained by Emin Pasha, which may be provisionally taken to represent the original *H. undulata*, Peters, whose type locality was Mossimboa, Northern Mozambique.

To the north again *H. macmillani*, Thos., is somewhat like it, but has markedly smaller teeth.

Helogale victorina ochracea, subsp. n.

General characters of the true *victorina* of German East Africa south of the Victoria Nyanza, but the buffy suffusion on the body and the clear buff of the face, under surface, and feet, and underside of tail replaced by ochraceous, tending towards the tawny found in the East African form just described. Tail more strongly ochraceous or tawny ochraceous than the body, the covering black and buff ticking less conspicuous. Crown not darker than back. Muzzle, sides of face, and throat tawny ochraceous.

Skull as in true *victorina*.

* P. Ac. Philad. 1896, p. 544.

† P. Z. S. 1895, p. 414.

Dimensions of the type (measured in flesh) :—

Head and body 218 mm.; tail 169; hind foot 45; ear 20.

Skull: condylo-basal length 48; length of p^4 on outer edge 4.3, greatest diameter 5.6.

Hab. Southern Uganda. Type from Ketoma, Ankole. Alt. 5000'.

Type. Adult female. B.M. no. 3. 11. 7. 14. Original number 298. Collected May 1903 by W. G. Doggett and presented by Col. C. Delmé-Radcliffe. Three specimens.

This form represents an intermediate stage between the distinctly buff *H. victorina* and the tawny *H. u. rufula* of British East Africa. At the same time its colour seems to be nearer that of the former than of the latter, and I therefore provisionally place it as a subspecies of *victorina*. Curiously enough, this relationship is more strongly brought out by artificial light than by daylight, *victorina* and *ochracea* being then scarcely distinguishable, while the tawny *rufula* shows up as a conspicuously different brownish animal.

Crossarchus ansorgei, sp. n.

Allied to *C. obscurus*, but considerably smaller.

General colour above and below coarsely grizzled blackish, as in *C. obscurus*, but with a strong tawny suffusion, the light rings on the long hairs buffy, and the underfur broadly tipped with tawny or tawny-ochraceous. Crown blackish. Sides of neck dull ochraceous. Forearms and hands black. Hind feet dull tawny proximally, black terminally. Tail mixed tawny and black, more tawny proximally, black terminally.

Skull intermediate in size between those of *C. obscurus* and *C. dybowskii*, its proportions about as in the latter, its palate less produced than in the former.

Dimensions of the type (measured in flesh) :—

Head and body 320 mm.; tail 212; hind foot 60; ear 24.

Skull: basal length 58; greatest breadth 33; interorbital breadth 13; breadth of brain-case 25.7; palatal length 31; front of canine to back of m^2 21.

Hab. N. Angola. Type from Dalla Tando. Alt. 800 m.

Type. Adult female. Original number 48. Collected 25th November, 1908, by Dr. W. J. Ansorge.

Whether the comparatively tawny tone of this *Crossarchus* will prove to be constant is, I think, doubtful, but it is in any case readily recognizable by its size, in which respect it forms an intermediate stage between *C. obscurus* and *C. dybowskii*. The four species of this group thus form a series in order of

size from the smallest upwards as follows: *dybowskii*, *ansorgei*, *obscurus*, and *alexandri*, the respective basal lengths of their skulls being 52, 58, 68, and 74 mm.

Funisciurus auriculatus boydi, subsp. n.

A darkened "saturate" form of *F. auriculatus*.

Colour darker throughout than in true *auriculatus*. Nape, and anterior back blackish, finely lined with pale buffy, much darker than the clear greyish of *auriculatus*. Posterior back more approaching hazel. Lateral line less conspicuous, its spots smaller, less sharply defined, buffy instead of whitish. Under surface ochraceous-buff. Hands and feet brown, lined with tawny, about as in *auriculatus*, not greyish as in the next form. Tail with the median part of its terminal portion below dark tawny, not so bright as in *beatus*.

Dimensions of the type (measured in the flesh):—

Head and body 225 mm.; tail 180; hind foot 47; ear 20.

Hab. Kameruns. Type from Mussaka, on the lower Mongo R., just east of Kamerun Mountain.

Type. Adult male. Original number 20. Collected 13th April, 1909, by Capt. Boyd Alexander.

By the kindness of the authorities of the Berlin Museum, the British Museum has been allowed to acquire by exchange an example from Barombi representing the true *F. auriculatus*, and the form now described may be readily distinguished from that animal by its much darker colour throughout, and especially its darker nape and shoulders.

In Prof. Matschie's original description it might appear that the type locality of *auriculatus* was Kribi, but he has kindly informed me that this is due to an accidental misplacement of the description, and that the three skins on which it was founded were from Barombi—as, indeed, would appear by the introduction to the paper. The specimen received from Berlin is therefore a metatype.

Funisciurus auriculatus beatus, subsp. n.

Colour throughout as in true *auriculatus*, but the feet, both fore and hind, dark grizzled grey, without suffusion of brown or tawny. Underside of terminal half of tail very bright ochraceous-buff, much paler and brighter than in *auriculatus* or *boydi*.

Dimensions of the type (measured in flesh):—

Head and body 230 mm.; tail 160; hind foot 45; ear 17.

Skull: greatest length 52; upper molar series from p^4 8.

Hab. Benito River, French Congo, 15 miles from mouth. Sea-level.

Type. Adult male. B.M. no. 0. 2. 5. 27. Collected 6th February, 1899; by Mr. G. L. Bates.

Dipodillus somalicus, sp. n.

Allied to *D. stigmonyx*, Heugl., but larger.

Size rather small. Fur soft and fine; hairs of back about 8–9 mm. in length. General colour above the usual bright sandy of the Gerbils, duller on the back, brighter on the flanks. Belly, hands, and feet, as usual, pure white. A well-marked white patch behind each ear; no dark nose-patch. Tail long, sandy buff proximally, lighter below, the terminal tuft, which is of medium development, brown.

Skull more flattened in the frontal region than that of *D. stigmonyx*; brain-case broad. Bullæ decidedly larger than in the allied species.

Dimensions of the type (measured in skin):—

Head and body 86 mm.; tail 128; hind foot 25·3; ear 12.

Skull: greatest length 28; basilar length 20; breadth of brain-case 13·3; palatal foramina 5·4; length of upper molar series 3·9.

Hab. Upper Sheikh, Somaliland. Alt. 4500'.

Type. Adult male. B.M. no. 9. 12. 17. 40. Original number 226. Collected 20th October, 1909, and presented by Dr. R. E. Drake-Brockman. Three specimens.

No Gerbil of this group has previously been described from Somaliland. The present form seems to be nearest to the Soudanese *D. stigmonyx*, but is larger in all dimensions.

MICRODILLUS, gen. nov.

Type *Microdillus peeli*. (*Gerbillus peeli*, de Wint. Ann. & Mag. Nat. Hist. (7) i. p. 250, 1898, description of skull only, not skin.)

The British Museum owes to Dr. R. E. Drake-Brockman a number of examples of a small short-tailed Gerbil from Upper Sheikh, Somaliland, which at first sight appeared to be distinct from anything previously described. Closer examination, however, shows that when describing his *Gerbillus peeli* Mr. de Winton was deceived by an erroneous label, and that the skin he described as that of *G. peeli* is that of a young *Ammodillus imbellis*, while the skull is that of an entirely distinct animal, whose external characters are now for the first time made available.

Since a choice has to be made, I propose, as first reviser, to select the skull and not the skin as the type of *peeli*, for it was the peculiarities of the skull on which Mr. de Winton laid primary stress in his account.

These peculiarities are, indeed, such that I now propose to separate the animal generically from *Dipodillus*, with which it has been associated since the general break-up of the old genus *Gerbillus*. Probably it has some distant affinity with *Desmodillus* and *Pachyuromys*, as its bullæ, although far smaller than in those genera, are larger than in *Dipodillus* and it has a similarly short tail.

Besides the characters mentioned by de Winton, it may be noted that the skull is abnormally bowed, with a strongly convex cranial profile, has an unusually broad brain-case, narrow interorbital constriction, and bullæ so developed as to surpass the occiput posteriorly.

Externally *Microdillus peeli* may be briefly described as of small size, with short ears and tail, essentially naked soles (a few scattered hairs present between the pads), and with prominent white spots behind the eyes and ears.

External dimensions of a male (measured in the flesh):—
Head and body 72 mm.; tail 57; hind foot 18; ear 10.

Cricetomys gambianus elgonis, subsp. n.

Apparently most nearly allied to the Ruwenzori *C. g. proparator*, Wrought., with which it shares the dark general colour and the comparatively short dark part of the tail, but distinguished by its dark under surface, which is as in *C. ansorgei*.

General colour above Prout's brown, darkened along the median dorsal area, lightening on the sides to broccoli-brown, which passes on to the belly almost without change, only becoming slightly greyer; a narrow sternal white patch present in one specimen. Face like back; indistinct dark areas round eyes and on nose. Feet dark brown; fingers and toes white or whitish, varying in their degree of contrast. Tail dark for about one-third its length.

Dimensions of the type (measured in the flesh):—

Head and body 380 mm.; tail 440; hind foot 73; ear 42.

Skull: basal length 69; nasals 30×10.2 ; palatal foramina 8.6; length of upper molar series 11.6.

Hab. Mount Elgon. Type from the south face of the mountain at 10,000'.

Type. Adult male. Rudd Collection. Original number 452. Collected 20th November, 1909, by Robin Kemp. Two specimens.

Although I provisionally include this distinct mountain form as a subspecies of *C. gambianus*, it is possible that it is rather a representative of the Angolan *C. ansorgei*, and that the dark-bellied forms may be related *inter se*, and distinct from those with white bellies.

Procavia daemon, sp. n.

A Dassie of the large-toothed group, allied to *P. jacksoni*, Thos., but with heavier teeth and more buffy colour.

Size about as in *P. jacksoni*. Fur long, rather softer than in typical *jacksoni*; hairs of back about 30 mm. in length. General colour "raw umber," darker and richer than in *jacksoni*, the subterminal rings on the hairs deep buffy. Underfur of anterior back brown proximally, dull pale buffy towards the end; of posterior back blackish brown, darker terminally than at base. Under surface usually richly coloured, between tawny ochraceous and clay-colour, the hairs paler, more buffy, at their bases. Crown grizzled blackish. Cheeks mixed buffy and blackish, a blackish patch below and behind each eye. Sides of neck dull cinnamon, succeeded on the shoulders by a more blackish tone. Hairs of dorsal spot strong buffy, becoming more ochraceous terminally.

Skull, as compared with that of *P. jacksoni*, broader and heavier, the nasals conspicuously broader posteriorly, the brain-case lighter (height from basilar suture to crown, in *daemon* 35, in *jacksoni* 30–32 mm.); basilar region ridged, the ridge on the anterior part of the unusually narrow basi-occipital sharp-edged.

Teeth markedly larger throughout.

Dimensions of the type (measured in flesh):—

Head and body 445 mm.; hind foot 71; ear 33.

Skull: basallength 84; condylo-basal length 91; greatest breadth 49; nasals 24.5×22 ; palatal length 46; diastema 12; front of p^1 to back of m^2 35, breadth of m^2 8.2.

Hab. Mount Elgon. Type from Elgonyi. Alt. 7000'.

Type. Subadult male (Stage V.). Rudd Collection. Original number 359. Collected 11th October, 1909, by Robin Kemp.

Procavia brucei princeps, subsp. n.

Size large, largest of the *brucei* group. Fur comparatively coarse and harsh; hairs of back about 22 mm. in length. Colour coarsely grizzled, mixed buffy and black, the light rings on the hairs creamy, stronger buffy down the centre of the back. Under surface prominently whitish, not buffy or

yellow; the hairs pale brown for their basal halves. Underfur of posterior back pale brown throughout; of shoulders brown at base, creamy white subterminally. Crown not conspicuously darker than back. Ears whitish, with light patches behind them, but not prominently contrasted with the general colour. Mammæ 1—2=6.

Skull long, narrow, with a particularly long muzzle. Basisphenoid with a sharp-edged crest running along it, very different from the broader ridge, hollowed laterally, of true *brucei*, and still more different from the evenly convex surface of the East-African forms of the group.

Dimensions of the type:—

Head and body 470 mm.; hind foot 66.

Skull: condylo-basal length 90; greatest breadth 50; nasals 23.5×16.5 ; diastema 14; palatal length 47; length of upper tooth-row from front of p^2 34.

Hab. Bourka, Arussi Country, near Lake Zuai. Alt. 5000'.

Type. Adult female. B.M. no. 6. 11. 1. 51. Original number 68. Collected 6th February, 1905, by Ph. Zaphiro, and presented by W. N. McMillan, Esq.

This fine Dassie is readily distinguishable by its large size and the peculiar sharp-edged crest developed along the basisphenoid.

Procavia brucei kempii, subsp. n.

A dark mountain form of the *brucei* group.

Fur soft and fine; hairs of back about 22–24 mm. in length.

Colour conspicuously darker than in other members of the *brucei* group, the general colour between mummy-brown and bistre, the light rings on the hairs narrow, dull buffy. Under surface soiled whitish, the hairs smoky grey for three-fourths their length, their tips dull whitish. Underfur of posterior back hair-brown, with dark tips, but anteriorly on the shoulders its middle third becomes lighter. Supra-orbital light spots well marked. Crown dark. Ears whitish, but without prominent postauricular patches. Rump with a few black bristle-spots.

Skull most like that of *P. b. thomasi*, Neum., the sphenoid raised up into a fairly narrow but not sharp-edged crest.

Dimensions of the type (immature, measured in the flesh):—

Head and body 395 mm.; hind foot 62; ear 20.

Skull: condylo-basal length 71; greatest breadth 42; nasals 15×17 ; diastema 9; palatal length 37.

Hab. Mount Elgon, Brit. E. Africa. Type from Elgonyi. Alt. 7000'.

Type. Immature female (Stage V.). Rudd Collection. Original number 390. Collected 20th October, 1909, by R. Kemp.

The difference in general colour of this Dassie from any of its allies is so conspicuous that I have no hesitation in describing it from a single specimen. It is no doubt a saturate mountain representative of the group. Though it is in Stage V. the interparietal sutures of the type are still visible, an unusual condition in this group and reminiscent of the West-African *P. latastei*.

Procapra punila, sp. n.

Allied to *P. brucei*, but conspicuously smaller.

General characters of *P. brucei*. Fur soft and fine; hairs of back about 16–17 mm. in length. General colour above grizzled greyish, rather more suffused with fawn than *brucei*, the hairs with narrow whitish or creamy subterminal rings. Dark bristle-spots apparently absent. Underfur drab-grey at base, dull whitish for its middle third, and with dark ends. Under surface greyish white; the hairs drab-grey at base, whitish terminally. Crown rather darker than back. Cheeks grizzled grey, a whitish patch over each eye. Ears generally white or whitish, but sometimes scarcely lighter than the head. Hairs of dorsal spot nearly pure white, slightly buffy terminally.

Skull very much as in *P. brucei*, except for its conspicuously smaller size.

Dimensions of the type (measured in flesh):—

Head and body 375 mm.; hind foot 52; ear 30.

Skull: basal length 65; condylo-basal length 69; greatest breadth 40; nasals 14.5×16.5 ; diastema 8.5; palatal length 36; upper tooth-row from front of p^1 to back of m^3 28.

Hab. Somaliland. Type from 50 miles S.E. of Berbera.

Type. Fully adult male. B.M. no. 4. 5. 9. 28. Collected 12th April, 1904, and presented by Major H. N. Dunn, R.A.M.C.

Many years ago I described from Berbera, Somaliland, a small form of *P. brucei*, *P. b. somalica*, and to this a considerable number of specimens since received have been referred. But I now find that nearly all these belong to a still smaller form, which differs so markedly in size that it should be considered as specifically distinct. Its range would appear to be in Somaliland south and south-east of Berbera.

How near it gets to the coast is not certain, as, though we have two specimens marked Berbera, these may have been brought from some little way inland.

Of the true *P. brucei somalica* we have the type from Berbera (*Lort Phillips*), one specimen from Gerbatir (*Menges*), and another from Bijjo, Eastern Abyssinia (*Degen*).

The following animal, similar in size but different in colour, may be considered as a subspecies of *P. pumila*.

Procavia pumila rudolfi, subsp. n.

Like true *P. pumila* in essential characters and its very small size, but darker in colour and with shorter fur.

Fur short, close and crisp; hairs of back only about 10–12 mm. in length. General colour above a dull brownish isabella, the hairs brown for four-fifths their length and with dull buffy (instead of whitish) subterminal rings. Dark bristle-spots unusually numerous, though not conspicuous, occurring all over the body and even on the belly. Under surface whitish, the hairs pale brown basally. Crown like back. Cheeks grizzled grey, with whitish supraorbital spots. Ears whitish, with small whitish patches behind them; in the single specimen the ears themselves seem unusually small, but I suspect they are abnormally contracted. Hairs of dorsal spot pale buffy.

Skull as in true *pumila*.

Dimensions of the type:—

Head and body 340 mm.; hind foot 51; ear 23.

Skull: basal length 57; condylo-basal length 61; greatest breadth 36; upper tooth-row from front of p^1 to back of m^2 23·5.

Hab. Lake Rudolf, north end. Alt. 2000'.

Type. Immature male (Stage V.). B.M. no. 6. 11. 1. 50*. Original number 127. Collected 7th August, 1905, by Ph. Zaphiro, and presented by W. N. McMillan, Esq.

XXIX.—*Descriptions of new Forms of Cercopithecus and Graphiurus from British East Africa.* By GUY DOLLMAN, B.A.

(Published by permission of the Trustees of the British Museum.)

Cercopithecus kolbi nubilus, subsp. n.

Allied to *Cercopithecus kolbi*, Neum., but rather smaller, much duller in colour on the back, and with a light greyish white under surface.

Size and general proportions rather less than in *C. kolbi*. Hair similar in texture, but a good deal shorter, measuring only about 43 mm. in length on the back, while in the type of *C. kolbi* the coat is very much longer, the hairs averaging about 70 mm. in length. General colour of dorsal surface more or less like that of *C. kolbi*, but much duller, especially on the rump and posterior part of back. Anterior portion of back, between shoulders, black speckled with greenish buff, the buff tint becoming more dominant towards the hind-quarters. General colour of rump and posterior part of back yellowish brown (between snuff-brown no. 1 and chamois no. 4, 'Repertoire de Couleurs'), strikingly different from the rich reddish colour on the back of *C. kolbi*. Individual hairs of rump pure greyish white at roots, turning to brownish grey towards the middle; apical portion composed of four buff-coloured bands alternating with four black bands, the terminal black bands constituting the hair-tips. Hair on forehead and top of head shorter and darker than in *C. kolbi*, the buff-coloured annulations on the hairs a good deal less prominent. Cheeks and sides of head clothed with comparatively short, greyish black hairs, slightly tinged with buff. Face, between eyes, sparsely covered with short black hairs. White ear-tufts present, but rather short, measuring only about 20 mm. in length, while in the type of *C. kolbi* the ear-tufts are nearly 30 mm. long. White patches on sides of neck arranged so as to form a more or less definite collar, extending upwards, on each side, on to the nape or summit of the neck, though this collar-like pattern is a good deal smaller and less conspicuous than in the Kenia form. Fore limbs brownish black; hairs grey, with black tips. The grey speckling of the dorsal surface extends for a short distance down the fore limbs, though not to such a marked extent as it does in *C. kolbi*. Hind limbs brownish black, speckled with grey; bases of hairs brownish grey, tips dark brown, banded with three or four greyish rings. Backs of hands and feet brownish black. Under surface of body thinly clothed with short greyish hairs, faintly speckled with silvery grey, quite different from the long dark grey hair on the belly of *C. kolbi*. Individual hairs of belly with greyish white bases, tips rather darker and banded with a few light grey annulations. White band across chest and throat not nearly so prominent as in *C. kolbi*, the hairs both shorter and less numerous. Chin sparsely covered with short white hairs. Tail similar to that of the Kenia species, but the hairs are rather shorter and the buff coloration of the rump does not extend down the dorsal surface for more than a few inches.

Skull very similar to that of *C. kolbi*, nasals rather shorter, and orbits larger.

Dimensions of the type (measured in the skin):—

Head and body 620 mm.; tail 650; hind foot 121; ear 27.

Skull: greatest length 96; basilar length 63·4; condylo-basilar length 70; zygomatic breadth 64; greatest width across orbital region (at fronto-jugal suture) 53; greatest diameter of orbit 24; breadth of brain-case (across squamosal region) 54; length of nasals 12; palatilar length 30; width of palate in front of last molar 21; length of upper tooth-row from front of first premolar to back of last molar 25.

Hab. Nairobi Forest, British East Africa.

Type. Adult female. B.M. no. O. 2. 1. 4. Original number 4. Collected by Mr. H. J. Mackinder on July 14th, 1899.

The much duller colour of the dorsal surface, lighter under parts, and less conspicuous white collar are the chief points of distinction between this Nairobi form and the Kenia specimens of *C. kolbi*.

Graphiurus microtis saturatus, subsp. n.

A dark race of *Graphiurus microtis*, Noack.

Size and general proportions very much as in *G. microtis*. Fur soft and of medium length, measuring about 7 mm. in length on the back. General colour of upper surface dark greyish brown (between ashy grey no. 4 and mouse-grey no. 4, 'Repertoire de Couleurs'). Individual hairs of back dark slate-grey, with yellowish brown tips. Flanks similar in colour to back. Sides of face, below eyes, white; hairs dark grey, with white tips. Eyes surrounded with dark brownish black rings, the dark markings extending forwards on to the nose. Backs of hands and feet covered with short white hairs. Under side of body grey, washed over with buffy white. Individual hairs of belly dark grey (Payne's grey no. 4, 'Repertoire'), with buffy white tips. Tail very similar in colour to back, rather redder on the upper surface. No well-defined white tip as in *G. microtis*, a few of the hairs at the extreme end of the tail being tipped with white.

Skull rather similar to that of *G. microtis*, nasal region narrower and rather more slender.

Dimensions of the type (measured in the flesh):—

Head and body 85 mm.; tail 70; hind foot 18; ear 15.

Skull: greatest length 27; basal length 22·3; condylo-basal length 24·5; basilar length 19·4; condylo-basilar length 22; zygomatic breadth 14·7; greatest width of brain-

case (across squamosal region) 13; interorbital constriction 4; greatest length of nasals 10; palatal length 10·5; palatilar length 8; length of upper molar series 3·5.

Hab. South face of Mount Elgon, British East Africa. Altitude 9000 feet.

Type. Adult female. Rudd Collection. Original number 442. Collected by Mr. R. Kemp on November 16th, 1909.

The series of Elgon specimens are so much darker in colour than the Tanganyika species that it is necessary to consider them as representing a distinct geographical race and deserving of subspecific rank.

XXX.—*Some Servals and an Otomys from East Africa.*

By R. C. WROUGHTON.

ON comparing some recently received specimens of Serval with those already in the Natural History Museum it appears that there are several forms sufficiently distinct to deserve subspecific names.

The following names have already been used in this group, viz. :—

1776. *Felis serval*, Erxleben, Syst. Regn. An. p. 523.

1781. *Felis capensis*, Forster, Phil. Trans. R. Soc. p. 1.

1820. *Felis galeopardus*, Desmarest, Mamm. p. 227.

1839. *Felis senegalensis*, Lesson, Mag. Zool., Mamm. tab. x.

1893. *Felis togoensis*, Matschie, S.B. Ges. nat. Fr. p. 109.

It has been found impossible to assign a distinct locality to typical *F. serval*; indeed, based as it is on Buffon's "Le Serval," it is clearly inapplicable to any African Cat. Accordingly I propose in this paper to ignore the name altogether in a technical sense, though the vernacular term Serval may still be used. The type locality of the first valid name *Felis capensis* is the Cape of Good Hope; while Matschie (*l. c.*), rightly it seems, places *senegalensis* as a synonym of *galeopardus*. There are thus names for forms from (1) Cape Colony, (2) Senegal, and (3) Togoland; the following forms seem readily distinguishable from any of these.

Felis capensis hindei, subsp. n.

A rather small Serval, with very heavy broad markings.

Fur long and silky (35–40 mm. on back). General colour above "ochraceous buff," paling through "buff" on the flanks to white on the belly. The usual Serval pattern, but the median dorsal lines broken into quite short lengths; all markings very coarse and broad; shoulder-stripes and spots on thighs 15–20 mm. in diameter.

Skull short and broad, with small teeth and bullæ.

Dimensions :—

Head and body (c.) 650 mm.; tail (c.) 300; hind foot 165.

Skull: greatest length 120; basilar length 97; zygomatic breadth 81; combined length of p^3 and p^4 22; length and breadth of upper carnassial 13×6 ; length of lower molar 9.5; bullæ 23.

Hab. East Africa (type from Machakos).

Type. Adult male. B.M. no. 98. 1. 5. 3. Collected and presented to the National Collection by Mr. S. L. Hinde.

A series of four specimens sent by Mr. Dundas from Aberdare Range, 7000 feet, are evidently this form.

Felis capensis kempii, subsp. n.

A Serval rather larger than the last and of a darker colour, with finer markings.

Fur about 30 mm. long on the back and silky, giving a sleek appearance to the coat. General colour above "cinnamon," paling through "buff" on the flanks to white on the belly; black markings fine and small, at most 10–15 mm. in diameter; median dorsal lines almost continuous from shoulders to lower back.

Skull stouter than in *F. capensis hindei*.

Dimensions of type (recorded by Collector):—

Head and body 775 mm.; tail 340; hind foot 182.

Skull: greatest length 126; basilar length 105; zygomatic breadth 87; combined length of p^3 and p^4 23.5; length and breadth of upper carnassial 14.5×6.5 ; length of lower molar 10; bullæ 24.3.

Hab. Kirui, Elgon. Alt. 6000 feet.

Type. Adult male. Rudd Collection. Original number 234. Collected 11th September, 1909, by R. Kemp.

Felis capensis beiræ, subsp. n.

A large Serval, with narrow median dorsal lines much broken up, and spots very small and numerous. Skull, and especially the teeth, peculiarly stout.

Fur short (25–30 mm. on back) and rather coarse.

General colour above "clay-colour," paling through "cream-buff" to white on the belly. Black stripes narrow and spots small, rarely reaching more than 10 mm. in diameter; median dorsal lines much broken up and whole lower back covered with small black spots.

Skull large; teeth very large and stout.

Dimensions of type (measured by the Collector):—

Head and body 837 mm.; tail 315; hind foot 192; ear 91.

Skull: greatest length 128; basilar length 108; zygomatic breadth 91; combined length of p^3 and p^4 26; length and breadth of upper carnassial 16×8 ; length of lower molar 12.3; bullæ 26.5.

Hab. Beira, Portuguese East Africa.

Type. B.M. no. 7. 6. 2. 29. Original number 1749. Collected 23rd December, 1906, by C. H. B. Grant, and presented to the Natural History Museum by Mr. C. D. Rudd.

Otomys irroratus elgonis, subsp. n.

An *Otomys* of the group with a deep and a shallow groove on the lower incisor, which, though by its skull-characters closely allied to *O. i. tropicalis*, falls by its size into the section containing the smaller members of the group.

General colour distinctly darker than in *tropicalis* ("seal-brown" and "mummy-brown" respectively).

Skull shaped much as in *tropicalis*, but in all ways smaller, frontal crests less marked, interorbital area wider.

Dimensions of type:—

Head and body 165 mm.; tail 81; hind foot 27; ear 21.

Skull: greatest length 41; basilar length 34; zygomatic breadth 20.5; interorbital breadth 4.6; brain-case breadth 15; diastema 10; upper molar series 9.

Hab. Elgonyi, Elgon, B. E. Africa. Alt. 7000 feet.

Type. Old male. Rudd Collection. Original number 340. Collected Dec. 4th, 1909, by R. Kemp.

Seven specimens examined.

From *irroratus nyikæ*, with which it agrees in size, *elgonis* is at once distinguishable by its darker colour and the broad nasals of the former, and the same character, as well as smaller size, separates it from *angoniensis*. It is undoubtedly most closely related to *tropicalis* from Mount Kenya (8000–10,000 feet), and differs entirely from its nearest neighbour *jacksoni* (Mount Elgon, 13000 feet), which has two deep grooves on the lower incisor.

XXXI.—On *Hexactinellid* Sponge Spicules and their Names.
By R. KIRKPATRICK.

(Published by permission of the Trustees of the British Museum.)

[Plate VIII.]

HEXACTINELLID spicules are often divided into two classes, megascleres and microscleres. The former uphold, fix, and protect the body as a whole, and the latter support the strands of the trabecular network.

The spicules may be classified in another way and on a purely morphological basis. Let it be supposed that examples of all known recent Hexactinellida have been put into a huge cauldron and boiled up with nitric acid, and the residual spicules arranged into groups according to their morphological characters, the sorter being biased by no phylogenetic fancies or speculations whatsoever. It would be found that the immense multitude of spicules would fall into two great main groups: let us call them for the moment A and B. In group A all the rays would be hollow (*i. e.* with axial canal) throughout, but in group B only the central end would be hollow and the rest of the ray or ray-system solid.

Definition.—The part of the ray with the axial canal is here termed the “actine,” the solid part or parts of the so-called ray or ray-system being termed end-spines or “distal appendages.”

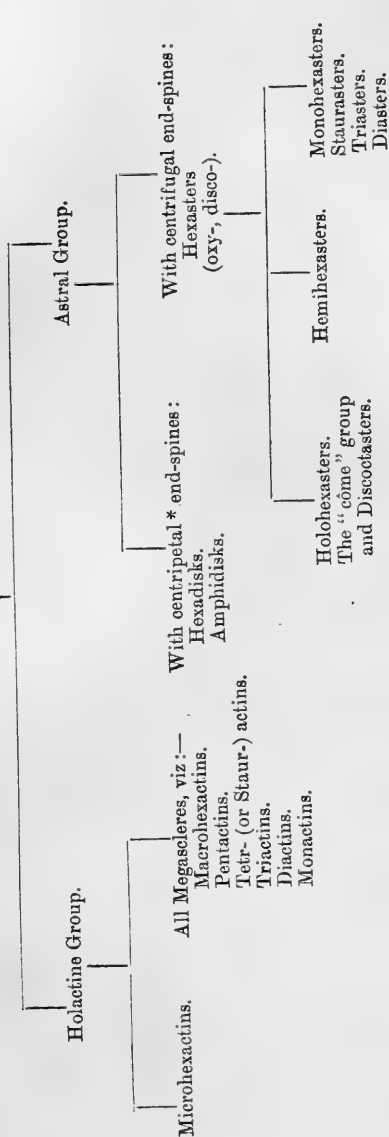
In describing specimens I shall continue to use the terms main or primary and end or secondary “ray”; but here it is necessary to emphasize the fundamental difference between the hollow and solid parts found in the rays of spicules belonging to group B. The use of the term end ray, as contrasted with main ray, is not, however, quite logical, because the difference is not merely one of position, like, say, the stem and branch of a tree, but there is a fundamental difference of character, the main ray being hollow and the so-called end ray solid.

What names should be given to groups A and B? Hom-axial or homactinal and heteraxial or heteractinal at first suggested themselves; but I soon found that these terms were wholly illogical. For both groups of spicules, *i. e.* all the spicules, are homaxial and homactinal, but group B has distal appendages or end-spines at the ends of its actines.

The names hexactin, hexaster, aster, are already in use, and the two former could not well be made to include pentactins,

Morphological grouping of:—

Hexactinellid spicules.



* For convenience the terms “centripetal” &c. are used instead of “centripetally directed” &c., and the centre referred to is the centre of the spicule, where the axial canals now cross or where they once crossed. Again, centripetal and centrifugal may be taken to mean shaftward or away from the shaft.

diasters, &c. Accordingly I suggest the terms Holactine* and Astral.

Holactine spicules have only actines. Astral spicules have end spines or distal appendages at the ends of the actines.

Notes on some of the above terms.

(1) Since there are no known hemipentasters &c., and, of course, no holopentasters &c., the prefix "mono-" is not required before "stauraster," "diaster," &c.

(2) Stauractin is used for spicules with four actines in one plane, and tetractin for spicules with rays forming a pyramid as in *Aulorossella longstaffi*, Kirkp.

(3) The correct designation for the spicule for which I suggested the name monoxyhexaster in the "Report on the 'Discovery' Hexactinellida," p. 3, footnote, has been the subject of controversy. The term was proposed for hexasters with only one end-spine to each actine. Ijima (Contrib. ii. p. 10, and iii. p. 118) called these spicules hexactinose hexasters, and "monoxyhexaster" was suggested by me as a convenient single word. Schulze (Abhand. Akad. Wiss. Berlin, 1903, p. 8) prefers the "actin" to the "aster" suffix, and in Prelim. Rep. 'Gauss' Hexactinellida (Zool. Anzeig. Jan. 4, 1910, p. 296) he uses the terms heterohexactin &c. In my opinion the use of such a term gives an undue importance to the question of the number of the end-spines.

The spicule which I term monohexaster is one with a centrifugal end-spine or distal appendage at the end of each actine, and therefore it must be grouped with the Astral group of hexasters with centrifugal end-spines, and not with the hexactins, in which the actines are wholly without end-spines or distal appendages. The relative unimportance of the mere number of spines is seen in the endless variation of these structures not merely in different spicules, but even in one and the same spicule (as in hemihexasters, hemicalycocomes, &c.). In my opinion the presence or absence of end-spines is the all-important point. If end-spines are absent the spicule is an "actin" spicule, if present an "aster" spicule.

The solid appendages at the ends of the (cored) actines of spicules of the Astral group are probably merely spines like the Seitenstacheln, as Schulze has already pointed out (Phys. Abhand. Akad. Wiss. Berlin, 1886, p. 15).

The variation in number &c. of end-spines is indicated by the prefixes holo-, hemi-, mono-. Strictly I should have

* ὅλος, sole or solely.

used the prefixes "holomono-" (all actines with one end-spine) and "holopoly-" (all actines with more than one end-spine), in contrast with "hemi-" (some actines with more than one, some with only one end-spine), but the sight of the word holopolydiscohexaster made me forbear! Even that apparently terrible word, however, is in reality a convenient shorthand term.

Monoxyhexasters often bear a deceptive resemblance to hexactins, but the presence of the coreless end-spine betrays the real nature. "Das also war des Pudels Kern"!

Ijima was the first to suggest what seems to me the logical terminology for spicules with one end-spine to each actine.

It is my conviction that the spicules of *Corbitella speciosa* (Q. & G.) and *Heterotella corbicula*, Bowbk., which Ijima terms spiny microhexactins will certainly be found to be monoxyhexasters (see Contrib. ii. pl. figs. 3, 9, 20-23) *.

Monoxyhexasters are found only in the suborder Hexasterophora, and microhexactins are never found in that suborder.

(4) Microhexactins are only found in the Amphidiscophora. Often these spicules have a granular surface excepting at the smooth centre, where alone the axial canals can be seen, being invisible in the rest of the length, for the same reason that it is impossible to see below the ruffled surface of a lake. It is nearly always possible to trace the canals, however, in other smoother examples from the same specimen.

(5) Hexadisk is not an entirely satisfactory term, because most calyccomes are also, in a sense, hexadisks. In the Amphidiscophoran hexadisks the end-spines are centripetal, but in the calyccomes they are directed centrifugally away from the disk or capitulum. The *essential* morphological difference is solely the direction of the end-spines, and the term that expressed that essential feature would have been the most suitable. For, according to my definition, a hexadisk as usually understood is undoubtedly a hexaster with centripetal end-spines (see Pl. VIII. fig. 9, showing the actine of an amphidisk with the end-spines).

I have put forward the theory that the difference between amphidisks and hexasters is due to differences in centripetal pressure at an early stage in the history of the Hexactinellida (Ann. & Mag. Nat. Hist. (8) iv. 1909, p. 479). The form of the amphidisk and hexaster is the index of the resultant

* Since the above was written I have managed to remove the window-pane cover slip from a valuable slide of *H. corbicula* in the Bowerbank Collection and to view the spicules under oil-immersion. I find, as I anticipated, that the so-called spiny microhexactins are spiny monoxyhexasters.

of centrifugal and centripetal pressure. No transitional forms are known. There is no fixed intermediate stage in an umbrella when it is held up in a high wind, and disaster (or the pointing of ribs in an opposite direction) is imminent. We get amphidisks in *Monaxonellid* sponges, especially in *Spongillidæ*, where these spicules may be definitely orientated in the gemmule coats, or scattered, and the spines of the disks may be at right angles to the shaft or bent down. Here the history is entirely different, and the resemblance with *Hexactinellid* amphidisks furnishes an instance of convergence. The effects of pressure on *Hexactinellid* spicules are abundantly in evidence. The subfamily *Acanthascinæ* is apparently an example of the effects of centripetal pressure leading to the formation of discoctasters, and suppressing more or less completely the actines of all the hexasters. In *Anoxycalyx ijimai*, K., one sees many hexasters with a bayonet kink at the base of the end-spines.

(6) Discoctasters are, as Schulze has shown, simply hexasters with the actines suppressed and the end-spines fused with neighbouring end-spines to form a new combination of eight groups of end-spines. The six axial canals of the atrophied actines are still visible in the centre of the spicule, as Ijima has pointed out. There is no difficulty about the position of these spicules in the morphological scheme sketched out above. The central node with its cross of six axial canals represents the six actines, and the eight secondary so-called rays which are without axial canals are the fused end-spines.

Turning aside from the morphological classification, it is very interesting to note how the morphological groups of spicules are distributed among *Hexactinellida*. Megascleres (A), *i. e.* macrohexactins and, I may now say, their derivatives, are found in both suborders; microhexactins (B) only in *Amphidiscophora*; centripetal hexasters and their derivatives (C) only in *Amphidiscophora*; and centrifugal hexasters (D) only in *Hexasterophora*. *Amphidiscophora* has groups A, B, C; *Hexasterophora* has groups A, D.

The association of B with C and the non-association of B with D are deeply significant facts, and are probably due to a common cause. I have suggested (*Ann. & Mag. Nat. Hist.* (8) iv. 1909, p. 481) that the existence of the amphidisks (diasters or reduced hexasters with centripetal end-spines) is due to the gathering of the trabecular tissue into strong concentric laminæ at the dermal, gastral, and canalar surfaces, and that the effect of the pressure on the end-spines was to give them a shaftward bend. Possibly the pressure of contractile surface laminæ may have prevented the development

of end-spines in the parenchymal microhexactins; or possibly, again, the parenchymal trabecular tissue was prevented from developing a complicated system of meshes requiring to be supported by centrifugal end-spines, as in the *Hexasterophora*. The end-spines of amphidisks appear to function as balancers for maintaining the orientation of vertical props, and the office of the end-spines * of hexasters is probably to support strands of a complicated network of secondary formation, the development of such meshes apparently being unhampered in the *Hexasterophora*.

The correct appreciation of the relation—in regard to absence or presence and direction—of the end-spine to the actine is not, as it might at first seem, a trivial matter, but important from the point of view not only of morphological classification of spicules, but also of phylogenetic interpretation.

EXPLANATION OF PLATE VIII.

Group A. Holactine Spicules (without end-spines).

- Fig.* 1. Hexactin.
- Fig.* 2. Stauractin.
- Fig.* 3. Triactin.
- Fig.* 4. Diactin.
- Fig.* 5. Microhexactin.
- Fig.* 6. Actine of same (in glycerine), $\times 1400$.

Several of these figures are slightly diagrammatic, the outline of the axial canals being exaggerated.

Group B. Astral Spicules (with end-spines).

- Fig.* 7. Hexadisk.
- Fig.* 8. Amphidisk.
- Fig.* 9. One end of amphidisk in optical section, showing axial canal terminating at upper end of actine and not prolonged into the centripetally directed teeth or end-spines (in glycerine), $\times 1000$.
- Fig.* 10. Part of hexaster (calycocome).
- Fig.* 11. Monoxyhexaster.
- Fig.* 12. Stauraster.
- Fig.* 13. Triaster.
- Fig.* 14. Diaster.

* In the *Ann. & Mag. Nat. Hist.*, Dec. 1909, p. 507, I spoke of end-spines acting as spandrils. This was an error, because spandrils (or spandrels) are spaces of a certain kind. I should have said "supporting rods."

PROCEEDINGS OF LEARNED SOCIETIES.

GEOLOGICAL SOCIETY.

November 17th, 1909.—Prof. W. J. Sollas, LL.D., Sc.D., F.R.S.,
President, in the Chair.

The following communication was read :—

‘The Faunal Succession of the Upper Bernician.’

By Stanley Smith, M.Sc., F.G.S.

The Bernician Series forms the upper and by far the larger division of the Lower Carboniferous sequence of Northumberland, and covers the greater part of the county. Below the Bernician lie the Tuedian beds. The Northumberland succession, together with the Lower Carboniferous rocks north of the Tweed, occupies the northern extremity of the Pennine Province of the Carboniferous Limestone Series, which stretches from Staffordshire into Scotland. The Carboniferous strata in Northumberland encircle the Cheviots on the south, east, and north, and dip from the volcanic inlier, so that the general strike forms a rough semicircle round the igneous massif, nearest to which consequently lie the lowest beds.

The Bernician is mainly built up of sandstones and shales, but intercalated among the arenaceous and argillaceous deposits are the various beds of limestone and numerous seams of coal.

In the Upper Bernician, the limestones are fairly thick, are constant, and are truly marine. The calcareous beds of Lower Bernician age are thin and impure, and frequently contain *Stigmaria* and other plant-remains. There are a few good marine limestones, but these are of local occurrence.

The Upper Bernician, taking the Redesdale Ironstone Shale as the base, answers to Tate's Calcareous Group; while the Lower Bernician is equivalent to Tate's Carbonaceous Group.

It is with the Upper Bernician only that the present paper is concerned.

The whole of the Upper Bernician Limestones belong to the *Dibunophyllum*-Zone, but they are capable of the following palæontological subdivision :—

a = Redesdale Ironstone Shale.

Shallow-water fauna, mainly lamellibranchs; corals rare.
Dibunophyllum near *θ* has been found.

I = Redesdale Limestone.

D1 fauna.

Dibunophyllum θ.

Carcinophyllum θ especially characteristic.

- II = Fourlaws and Oxford Limestones.
D 2.
Lonsdalia floriformis enters.
- III = Eelwell, Acre, and Four Fathom Limestones.
D 2—3 presents in its main character a Zaphrentid phase.
- IV^a = Great and Little Limestones.
D 3.
Dibunophyllum muirheadi.
Koninckophyllum magnificum.
Diphyphyllum dianthoides.
- IV^b = Corbridge, Thornbrough and Robsheugh Limestones.
The tendency in the Dibunophyllids towards Aspidophylloidal structure reaches its highest development.
- IV^c = Fell Top Limestone.
Characterized by the presence of *Dibunophyllum muirheadi* mut., cf. *Dibunophyllum* ψ , and *Phillipsastræa radiata*.

MISCELLANEOUS.

RICHARD B. SHARPE, LL.D.

THE obituary notice of the late Dr. Sharpe which appeared in the last number of the 'Annals' does no more than justice to his devotion and energy in the cause of ornithological science—qualities the value of which to the British Museum no one could better appreciate than myself, who for more than twenty years was in daily personal contact with him and his work. I, besides, had occasion of admiring the courage which sustained him under difficulties that would have damped the enthusiasm and activity of most men. His merits are sufficiently great not to require enhancement beyond those due to him, and it will not be considered a detraction from them when, in the interest of the history of the Zoological Department, I supplement some remarks on two points referred to in the Notice.

When Dr. Sharpe entered the service of the Trustees he possessed a miscellaneous series of British and European birds, which he presented to the Museum, and a large and valuable collection of African birds; this latter was purchased of him for the departmental collection.

The formation of a series of nature-groups illustrating the nidification of British birds was, like the preparation of a descriptive general Catalogue of Birds, decided upon before Dr. Sharpe's appointment, and even the lines on which these two undertakings were to be executed had been distinctly planned. To the former Dr. Sharpe

made the first contribution in the shape of the group of Coots, as stated in the Notice, but, according to my recollection, it was the only one during the period of my Keepership, the work on the Catalogue and the increase and care of the *study*-collection occupying the whole of his time.

ALBERT GÜNTHER.

On the Nomenclature of Echinoderms.

To the Editors of the Annals and Magazine of Natural History.

GENTLEMEN,—Having written in your pages of late on the nomenclature of various Echinoderms, perhaps I may be permitted to express cordial agreement with the paper by Dr. Th. Mortensen in your January number. On two points only would I comment.

Dr. Mortensen does not see the necessity for working out the history of each name, since the proposed decision "is to be made against history." The reason why the adjudicating Committee should have all the facts before it is that a decision made, on the advice of one set of specialists, to escape evils in one group of animals, might lead to worse evils in another group. Hence complaints, wrangling, and further arbitrary decisions.

The important point emphasized by Dr. Mortensen is that the name must be fixed by reference to a genotype; but it will also be necessary to fix the holotype of the genotype. This was made clear by the recent discussion on *Cidaris* in these pages.

Yours faithfully,

Natural History Museum,
7th Jan., 1910.

F. A. BATHER.

Note on the Occurrence of Hippolyte gracilis (Heller) in the British Area. By A. O. WALKER, F.L.S., F.Z.S.

When dredging on the *Zostera* banks at Worthing on Sept. 30th last, at a depth of about 6 feet I took two specimens of this Mediterranean species. So far as I know it has not been recorded before in the British Area proper, which does not include the Channel Islands, from which I reported a specimen taken by Mr. James Hornell in Ann. & Mag. Nat. Hist. ser. 7, vol. iii. (1899) p. 148. The specimens were associated with *H. varians*, Leach, and are now in the British Museum, where they have also been identified by Dr. W. T. Calman.

WORKS PUBLISHED BY TAYLOR AND FRANCIS.

- The London, Edinburgh, and Dublin Philosophical Magazine. Monthly. 2s. 6d.
- The Annals and Magazine of Natural History. Monthly. 2s. 6d.
- The Observatory, Monthly Review of Astronomy. 1s.
- Aéronautics, by Brewer and Alexander. 6s.
- Anderson's Fauna of Mergui Archipelago. Vol. I. 30s., Vol. II. 15s.
- Baird's Manual for Tidal Observations. 7s. 6d.
- Blakesley's Table of Hyperbolic Sines and Cosines. 1s.
- Cooke's Flora of the Presidency of Bombay. Vol. I., Part I. 8s., Part II. 9s., Part III. 10s. Vol. II., Part I. 9s., Part II. 9s., Parts III. & IV. 8s. each.
- Cunningham's Binary Canon. 15s.
- Denning's Great Meteoric Shower of November. 1s.
- Denning's Telescopic Work for Starlight Evenings. 10s.
- Douse's Introduction to Gothic of Ulfilas. 7s. 6d. net.—Examination of an Old Manuscript, sometimes called The Northumberland Manuscript. 2s. 6d. net.
- Examination Papers set by Examining Board of Physicians and Surgeons. 6d.
- Ditto for Diploma in Public Health. 6d.
- Faraday's Experimental Researches in Chemistry and Physics. 15s.
- Fauna of British India : Mammalia. 20s. — Fishes. 2 vols. 20s. each.—Birds. Vol. I. 20s. Vols. II., III., and IV. 15s. each.—Reptilia and Batrachia. 20s. — Moths. 4 vols. 20s. each.—Hymenoptera. Vol. I.: WASPS AND BEES. 20s. Vol. II.: ANTS AND CUCKOO-WASPS. 20s.—Arachnida. 10s.—Rhynchota. Vols. I.-III. 20s. each. Vol. IV., pts. 1 and 2. 10s. each.—Butterflies. Vols. I. and II. 20s. each.—Coleoptera. Vol. I. 10s.—Coleoptera. CHRYSOMELIDÆ, Vol. I. 20s.—Mollusca. 10s.
- Glaisher's Barometer Tables, 1s. Diurnal Range Tables, 1s. 6d.
- Glaisher's Hygrometrical Tables. 2s. 6d.
- Glaisher's Factor Tables for Fourth, Fifth, and Sixth Millions. 20s. each.
- Godwin-Austen's Land and Freshwater Mollusca of India. Vol. II., Part X. 21s.
- Joule's Scientific Papers. Vol. I. 20s. Vol. II. 12s.
- Kelvin's (Lord) Tables for facilitating Sumner's Method at Sea. 10s. 6d. Forms for ditto. SUN, 1s. STARS, 1s.
- Kirby's Supplement to Diurnal Lepidoptera. 1871-1877. 8s. 6d. net. Lepidoptera Heterocera.—SPHINGES & BOMBYCES. 1892. £2 2s. net. Neuroptera Odonata. 1890. 16s. net.
- Lehfeldt, R. A. A List of chief Memoirs on Physics of Matter. 2s. 6d.
- Lewis's Systematic Catalogue of Histeridæ. 5s. net.—Catalogue of Japanese Coleoptera. 2s. 6d.; on one side, 3s. 6d.
- London Hospital Pathological Catalogue. 7s. 6d. net.
- M'Intosh's Marine Invertebrates and Fishes of St. Andrews. 21s.
- Physical Abstracts. Vols. I. to III. 17s. 6d. each.
- Physical Memoirs, translated from foreign sources. Vol. I. Part I. 4s. Part II. 7s. 6d., Part III. 6s.
- Reade's Origin of Mountain-Ranges. 21s.
- Royal College of Surgeons : Calendar. 1s. net. Catalogue of Specimens illustrating the Osteology of Vertebrate Animals in Museum. Part 3. Aves. 12s. net. Catalogue of Teratological Series. 5s. net. Dermatological Collection. 3rd ed. 4s. net. Physiological Series. Vols. I. and II. 2nd ed. 12s. net each. Appendices 5, 6, 7, 8, and 9 to the Second Edition of Descriptive Catalogue of the Pathological Specimens in Museum. 2s. each. Examination Papers for Diploma of Fellow and Licence in Dental Surgery. 6d.
- Univ. Coll. London Calendar, 2s. 6d. Pathological Catalogue, Parts 1 to 3, 2s. each; Part 4, 1s. Library Catalogue, 3 Vols. 7s. 6d.
- Univ. Coll. Medical and Biological Catalogue. 2s. 6d.
- Wheatstone's Scientific Papers. 15s.

	Page
XVII. Descriptions and Records of Bees.—XXV. By T. D. A. COCKERELL, University of Colorado.....	133
XVIII. Some undescribed <i>Gerrinae</i> . By W. L. DISTANT.....	140
XIX. On the Lamellicorn Beetles of the Genus <i>Peltonotus</i> , with Descriptions of Four new Species. By GILBERT J. ARROW.....	153
XX. Crustacea collected by the late Mr. R. L. Ascroft and Mr. Harvey in the North of the Bay of Biscay. By ALFRED O. WALKER, F.L.S., F.Z.S.	158
XXI. On some new Species of Silver-Pheasants. By EUGENE W. OATES.....	162
XXII. On the Wallabies usually referred to <i>Macropus agilis</i> , Gould. By ERNST SCHWARZ.....	164
XXIII. New <i>Pterasteridae</i> from the North Pacific. By WALTER K. FISHER, Stanford University, California.....	167
XXIV. New Genera of Starfishes. By WALTER K. FISHER, Stanford University, California.....	171
XXV. On a Collection of Mammals made by Mr. S. A. Neave, during his Expedition in Northern Rhodesia. By GUY DOLLMAN ..	173
XXVI. On Two new Species of Wood-boring Crustacea from Christmas Island. By W. T. CALMAN, D.Sc. (Plate V.)	181
XXVII. Notes on the Choanoflagellate Genera <i>Salpingoeca</i> and <i>Polyoeca</i> , with Description of <i>Polyoeca dumosa</i> , sp. n. By J. S. DUNKERLY, B.Sc., Assistant in Zoology Department, Birkbeck College, London. (Plates VI. & VII.)	186
XXVIII. Further new African Mammals. By OLDFIELD THOMAS.	191
XXIX. Descriptions of new Forms of <i>Cercopithecus</i> and <i>Graphiurus</i> from British East Africa. By GUY DOLLMAN, B.A.	202
XXX. Some Servals and an <i>Otomys</i> from East Africa. By R. C. WROUGHTON.....	205
XXXI. On Hexactinellid Sponge Spicules and their Names. By R. KIRKPATRICK. (Plate VIII.)	208

PROCEEDINGS OF LEARNED SOCIETIES.

Geological Society	214
--------------------------	-----

MISCELLANEOUS.

RICHARD B. SHARPE, LL.D.	215
On the Nomenclature of Echinoderms. By F. A. BATHER.....	216
Note on the Occurrence of <i>Hippolyte gracilis</i> (Heller) in the British Area. By A. O. WALKER, F.L.S., F.Z.S.	ib.

* * * It is requested that all Communications for this Work may be addressed, post-paid, to the Care of Messrs. Taylor and Francis, Printing Office, Red Lion Court, Fleet Street, London.

THE ANNALS
AND
MAGAZINE OF NATURAL HISTORY,
INCLUDING
ZOOLOGY, BOTANY, AND GEOLOGY.



CONDUCTED BY

ALBERT C. L. G. GÜNTHER, M.A., M.D., PH.D., F.R.S.,
WILLIAM CARRUTHERS, PH.D., F.R.S., F.L.S., F.G.S.,
AND
WILLIAM FRANCIS, F.L.S.

BEING A CONTINUATION OF THE "ANNALS" COMBINED WITH
MESSRS. LOUDON AND CHARLESWORTH'S "MAGAZINE OF NATURAL HISTORY."

WITH TWO PLATES.

Illustrative of Mr. E. Shann's Paper on the Life-history and Rate of Growth
in *Gobius minutus*.

LONDON:

TAYLOR AND FRANCIS, RED LION COURT, FLEET STREET.

Sold by Simpkin, Marshall, Hamilton, Kent, & Co., Ltd.; Baillière, Paris;
Hodges, Figgis, & Co., Dublin; and Asher, Berlin.

THE FAUNA OF BRITISH INDIA, INCLUDING CEYLON AND BURMA.

Published under the authority of the Secretary of State for India in Council.

Edited by A. E. SHIPLEY, M.A., F.R.S.

Med. 8vo, with text illustrations and 10 plates. Price 10s.

DERMAPTERA (EARWIGS). By Dr. MALCOLM BURR, M.A., F.L.S.

TAYLOR and FRANCIS, Red Lion Court, Fleet Street, E.C.

BIOLOGIA CENTRALI-AMERICANA.

Edited by F. DUCANE GODMAN.

SUBJECTS IN PROGRESS.

ZOOLOGY.

Chilopoda and Diplopoda. By R. I. POCKOCK. (Pp. 1-152, pls. i.-xi.)
Coleoptera. Vol. IV. part 3 (RHYNCHOPHORA: Curculionidæ). By
D. SHARP. (Pp. 1-168, pls. i.-vi.)
Coleoptera. Vol. IV. part 7 (RHYNCHOPHORA: Curculionidæ, *continued*).
By G. C. CHAMPION. (Pp. 1-48, pls. i., ii.)

The Price of each Part is 21s.

London: Published for the Editor by DULAU & Co., Soho Sq., W.

LAND AND FRESHWATER MOLLUSCA OF INDIA.

Part X. Vol. II. Price 21s.

By Lieut.-Col. H. H. GODWIN-AUSTEN, F.R.S.

With 17 Plates and Text, treating of the following Genera and Sub-Genera, with anatomical details:

Macrochlamys, Bensonia, Austenia, Taphrospira, Sophina, Euplecta, Kaliella, Durgella, Leptodontarion, Lamprocystis, Corilla, Plectopylis, Thysanota, Philalanka, and Sykesia; and the following new Genera: Dalingia, Sarika, Rahula, and Staffordia.

TAYLOR and FRANCIS, Red Lion Court, Fleet Street, E.C.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[EIGHTH SERIES.]

No. 27. MARCH 1910.

XXXII.—*Some Notes on the Life-history and Rate of Growth in Gobius minutus.* By EDWARD SHANN, B.Sc., Gatty Marine Laboratory, St. Andrews.

[Plates IX. & X.]

Introductory.

A CONSIDERABLE amount of literature bearing on the Gobiidæ has been published in recent years, but there still remain many points, especially in connexion with the life-history and rate of growth of these small fishes, which require elucidation. The bulk of the work hitherto accomplished has left little to be desired with regard to description of species, and even the classification of the group has been reduced to a comparatively orderly condition; only the artificial means adopted for "running down" species vary with different authors, and it has been found that the method of Holt and Byrne * is a most practical aid in this respect. The economic value of

* Irish Fisheries Report, part ii. p. 42 (1901).

the gobies is the important part they take in the diet of the food-fishes.

The material at my disposal was for the most part collected by Professor M'Intosh during trawling and other expeditions in the years 1886-95. The fishes were preserved in spirit; thus, though they were decolorized, both the skeletal and soft parts were well preserved. The collection contains specimens of *G. minutus* from all parts of the east coast of Scotland, and taken at various seasons of the year. There are also a number of specimens of *G. flavescens* (olim *ruthensparri*) collected during the same period. Both these species are common in St. Andrews Bay, the former on a sandy bottom usually near land, the latter among the rock-pools. I am indebted to Dr. Williamson for the loan of a collection of gobies belonging to the S. F. B., also to Mr. Richard Elmhirst, Millport Marine Station, for several specimens of *G. minutus* from the Clyde area. The majority of this collection were preserved in formaline; so that, though the colouring in many cases remained, the otoliths and often the scales were entirely missing. This was unfortunate, because the evidence of the latter structures was required to corroborate observations on the rate of growth. My obligations are due to Dr. Tosh for some notes which he had formerly made on the same collection of gobies, and which he put at my disposal. Finally, I have to thank Professor M'Intosh, who has throughout my work offered many helpful suggestions and kindly criticisms.

General Outline of Life-history.

The spawning of *G. minutus* has been described by M'Intosh and Masterman*, also by Holt and Byrne†, and the eggs by the same authors. In this paper little or no reference will be made to that part of the subject, the inquiry having been instituted to describe the young forms captured in various localities, and particularly in St. Andrews Bay, and approximately to ascertain their ages. The first spawning of *G. minutus* appears to take place about the middle of April, for larval forms 5.5 mm. in length have been obtained at Station IV., Moray Firth, on May 2nd. Larval forms occur not infrequently in September; as an instance, four

* 'British Marine Food-Fishes,' p. 168.

† Report on the Sea and Inland Fisheries of Ireland for 1901, part ii. p. 53.

specimens, averaging 4 mm., obtained at Station V., Moray Firth, on September 12th, 1890, may be mentioned. Thus the spawning period extends over many months. However, as the appended tables will show, the larval forms occur most frequently in the summer months, and reach a maximum in June. There are no ova of *G. minutus* in the collections on which the present work is based, but they are said by the authors above mentioned to measure 1.1 to 1.2 mm. along the major axis*. The smallest larval forms in the collections measure 1.5 mm.; these were obtained in a bottom-net at St. Andrews on June 26th and 27th, 1891, and must have been newly hatched. There is undoubtedly considerable variation in *G. minutus*, but it may be stated at the outset that, so far as the writer is aware, the majority of the specimens with which this paper deals belong to the typical race, i. e. *G. minutus major*, Heincke, as opposed to the estuarine race, which finds its extreme in the variety *G. microps*, Kröyer. The lack of pigment (owing to the fact that the majority of my specimens were preserved in spirit) renders this opinion doubtful, but the size of the largest specimens from the St. Andrews area agrees closely with that given by Holt and Byrne for the typical race, i. e. 80 mm. Most of the specimens from the Clyde area, on the contrary, were preserved in formaline, and have retained their pigment, but in these forms the vertical barred marking characteristic of the estuarine race was not observed, although the length of the largest specimens rarely exceeds 60 mm.

The appearance and coloration of larval gobies 3–5 mm. is well described by M'Intosh and Masterman†. As before stated, all the larval gobies were preserved in spirit, so that no further observations with regard to coloration have been made. Holt and Byrne say of the larvæ of *G. minutus*:—"The young when hatched already have their mouths open and yolk-sacs nearly absorbed, and soon attain the form of the adult." These statements are borne out by Pl. IX. fig. 1, representing a larval form only 2 mm. in length. It will further be seen that numerous small oil-globules are scattered through the yolk-sac, and that there is a pre-anal fin, though the latter can hardly be described in this case as "considerable"‡. The rays of the soft dorsal and anal fins

* Mr. Holt in an earlier paper (Ann. & Mag. Nat. Hist., July 1890, p. 34) gives the measurement as 1.4 to 1.2 mm.

† *Op. cit.* p. 169.

‡ E. W. L. Holt, Ann. & Mag. Nat. Hist., July 1890, p. 37.

appear in 4 mm. specimens, but these fins are not well developed till 5-5.5 mm. is reached. In most 4 mm. specimens, too, the otolith and the nasal aperture can be clearly distinguished, the former in a median position slightly anterior to the gill-slit, while the latter is placed midway between the eye and the point of the snout. By the time 4.5-5 mm. is reached all trace of the yolk-sac has disappeared, and this point in the development may be said to mark the transition from the larval to the postlarval condition. The spiny dorsal and ventral fins appear in forms from 6.5-7 mm. In the anterior portion of a 7 mm. specimen, depicted in Pl. IX. fig. 3, the fused ventrals can be seen slightly posterior to the gill-slit. In the same figure the fore, mid, and hind brain are clearly shown; the otolith has approached nearer to the eye than was the case in the larval forms; the nasal aperture can be seen slightly above the line joining the centre of the eye to the point of the snout; the teeth are well developed, and the highly inclined mandible is characteristic of gobies of this size. The eye throughout the larval and most of the postlarval stages is lateral in position, but at 10-12 mm. it is found in the dorso-lateral position which it retains throughout the remainder of the life of the fish. The latter position is attained by a gradual vertical displacement. In forms from 6-7 mm. the posterior extremity of the notochord is curved sharply upwards, and the hypural bones of the tail can be clearly distinguished with the aid of the microscope (see Pl. IX. fig. 2). The caudal fin-rays are sixteen in number, and thereafter increase in size but not in quantity.

About 12 mm. the outward appearance of the adult is assumed, and the gobies may thenceforward be described as young, in contradistinction to the postlarval. A specimen 40 mm. in length was captured at St. Andrews towards the end of April, another 32 mm. at Station V., Firth of Forth, early in February, and eight averaging 34 mm. off Aberdeen in the middle of May. All these were young gobies approaching the end of their first year of growth, and with it sexual maturity. Six specimens averaging 53 mm. were procured at St. Andrews in August, five averaging 50 mm. at Station V., Firth of Forth, in October, and one 60 mm. off Aberdeen in the middle of May. All these specimens were fully adult. Thus it may be concluded that sexual maturity is reached in *G. minutus* when the individual has attained a length of not less than 45 mm., or, roughly, after the termination of twelve months' growth. In corroboration of this statement the following paragraph may be quoted from the

paper by Holt and Byrne * to which reference has already been made:—

“Probably the life of this species (*G. minutus*) seldom extends over two winters; a specimen kept in a tank at Plymouth attained a length of 76 mm., and was fully adult about a year after the probable date of hatching.”

In the present inquiry no example of such rapid growth can be quoted, but the large size of the specimen described above may have been in part due to the effects of a comparatively high temperature and plentiful food-supply. At the same time there are six specimens in the collection captured near St. Andrews early in September, and therefore approximately 15 or 16 months old, which have an average length of 75 mm., and the largest is 80 mm. Most of the adult fishes appear to die off during the winter following their breeding-season, for only two such occur in the large collection at my disposal from November to March. The two adult specimens referred to were captured near St. Andrews towards the end of January, and average 78 mm. An interesting experiment might have been made if these gobies had been kept alive in a tank; but as one of them had already reached 80 mm., which is the normal limit of growth for the species, it is more than probable that they were nearing the end of their natural life.

Statistical Tables and their Graphic Representation.

All the bottles of gobies in the two collections were first arranged in chronological order, according to the dates on which the fishes had been taken. Then the numbers in each catch were counted, and the average length, inclusive of the caudal fin, noted. It seemed more than possible that the rate of growth and the maximum size attained by individual fishes might vary in different areas. Accordingly the results were divided into four groups, in relation to the areas in which the gobies were taken. Thus, four statistical tables are formed, I. St. Andrews Bay; II. Forth Area; III. Clyde Area; IV. N.W. Area (including Aberdeen Bay and the Moray Firth). A word must be said with regard to the first column in the tables headed “Date of capture.” It is apparent that an arrangement of dates in which the years are not taken into account must be defective; but it was considered that a better end would be served by arranging the fishes according to the

* *Op. cit.* p. 53.

season in which they were captured than by stating merely the historical order of their addition to the collection. Moreover, the data for any one year were not sufficient in themselves to elucidate the problem of the rate of growth of the species. The calculated age, owing to the fact that young gobies may be hatched at any period from the middle of April to the end of August, can only be a rather crude approximation to the truth. This method of calculation rested primarily on the average rate of increase in length per month. It seemed probable that by taking for the first example a comparatively old specimen, there would be less risk of error in obtaining this average. Accordingly the average length of six specimens captured in St. Andrews Bay on 5/9/89 was taken; this was nearly 75 mm. Now the greatest number of larval forms occurs, as has been stated, in June; so that it may be inferred that the time when the maximum number of these is hatched is the end of May and beginning of June. Combining these conclusions with the fact that larval gobies are about 1.5 mm. in length on hatching, it may be stated, generally speaking, that a specimen of *G. minutus* hatched at the beginning of June will increase in length $75 - 1.5 = 73.5$ mm. by the beginning of September of the following year, *i. e.* in fifteen months' time. From this the average rate of increase in length per month may be deduced, viz. $\frac{73.5}{15} = 4.85$ mm. It seemed more than probable that the rate of growth would be accelerated during the spring and summer and retarded during the late autumn and winter. The otoliths of the specimens averaging 75 mm. were examined, and occasion will be found to deal with these more minutely later on. At present it is only necessary to remark that the otoliths showed a thin zone, which had every appearance of indicating a retarded period of growth. One of the largest specimens of *G. minutus* captured in St. Andrews Bay during its first summer measured 20 mm.: the date of capture was Sept. 17th. This fish would be rather over $3\frac{1}{2}$ months old if it had been hatched at the most prolific spawning-period. During that time it had increased $20 - 1.5 = 18.5$ mm.; the average rate of growth per month is $\frac{18.5}{3.5} = 5.30$ mm. It will be noticed that an exceptionally large first-year form was taken during September and measuring 30 mm. This fish must have been one of the earliest of the season; its age is estimated at $4\frac{3}{4}$ months, but even this estimate gives an increase of 6.00 mm. per month. However, the rate of growth of no fish is so even that it can be ex-

pressed by a constant formula. There are always exceptional cases which seem to disprove the most carefully constructed theories in this connexion. But when one considers the changing conditions of the food-supply, of temperature, of fitness for survival of individuals, and of specific variation, such exceptions must be inevitable. A 40 mm. form was captured at St. Andrews towards the end of April. Supposing this was one of the group which reached 20 mm. in the preceding September, a growth of 20 mm. would have occurred during the seven intervening months. This only allows an increase of approximately 3 mm. per month, during the months of late autumn, winter, and early spring. In a case of this nature the rate of growth per month works out too low in the estimation of the writer, and the age of the fish has been calculated as if it had been hatched at the end of June or early in July, in other words, a month later than the typical period. Thus the age of this 40 mm. specimen caught in April is given as 10 months. In each case the "Calculated age" has been arrived at by such arguments as the above.

The figures included in the four statistical tables were reduced to a graphical form. The horizontal line was divided into equal spaces, each representing a month from May onwards*. The vertical line represents the average length of the fish in mm. The dark line drawn parallel to the basal line, and 1.5 mm. distant, marks the average length at which gobies are hatched from the egg. The points on the graph indicate the average length of fish actually caught on a given date. Thus, two gobies averaging 9.0 mm. were caught at St. Andrews on 13/7/88; taking Graph I., St. Andrews, and following the horizontal line nearly to the point representing the middle of the first July after hatching, then turning in a vertical direction till the 9 mm. horizon is reached, the point representing the above catch is encountered. An element of inaccuracy is introduced here again by the fact that no account is taken of the year in which the fishes were collected. The dotted lines joining the points on the graph represent the author's views with regard to the rate of growth. For instance, in Graph I., St. Andrews, one of these lines joins a point on the 5.5 mm. line above the first third of the space representing June to a point on the 17.2 mm. line above the far end of the space representing July. This implies that a

* The spaces should have been proportional to the days of the month which they represent; but for practical purposes the slight error introduced may be neglected.

goby 5.5 mm. long on June 9th might attain 17.2 mm. on July 31st. These lines of growth, as they may be termed, are seen to make a more acute angle with the base-line in the region representing the winter months, which indicates a less vigorous rate of growth than in the summer months. It may be that there is a complete cessation of growth during mid-winter, in which case the two extremities of the growth-line between September and April would be more highly inclined, and the complete cessation of growth indicated by a line parallel to the base-line; but of this there is no direct proof. In order to prevent confusion the joining up of all the points on the graph has been avoided, and a mean point between a group of actual points has been preferred as a guide. For the same reason, and because it is not probable the rate of growth is constant for all specimens of *G. minutus* (even at the same period of the year), some of these growth-lines, not too widely separated, have been caused to converge and to continue in the same line. The graphical method has the further advantage of bringing out clearly the months in which gobies of a certain length are most prevalent.

From Table II., with its appended graph representing the rate of growth of *G. minutus* in the Forth area, it seems that these fishes neither grow so fast nor attain such a length as their neighbours in St. Andrews Bay. The average rate of growth per month for the summer period is about 3.5–4.5 mm., while that for the winter months scarcely exceeds 1.0 mm. Both here and in the N.E. area a curious late brood of this species of goby exists; the young attain only 7.0 mm. at the end of November in this case, and are probably equivalent to those which reach 4.7 mm. in October in the Moray Firth. It seems probable that the majority of larvæ are hatched rather later than in St. Andrews Bay, for numerous captures of larvæ are made in July and August.

In the Clyde area a most interesting series of catches was made in October, 1899, the results of which shed much light upon the rate of growth of *G. minutus* in this area. One batch was taken on the 7th of the month, the other three, at different stations, on the 10th. It was evident at a glance that each batch of these fishes could be divided, according to the length, into two clearly defined groups. The length of the larger fishes approached 60 mm., that of the smaller 35 mm. It seemed clear that the 35 mm. specimens were the fishes of the current year, while the 60 mm. forms had been hatched in 1898. Thus at a glance the approximate growth of *G. minutus* in the Clyde area was obtained, *i. e.*

35 mm. the first four months and 25 mm. in the next twelve. It is hard to reconcile this conclusion with that formed from observation of the gobies of St. Andrews Bay. The rate of growth during the first four months is far more rapid in the Clyde forms, viz. 8.4 mm. per month as compared with 5.3 (rarely more) on the east. On the contrary, the average growth per month during the succeeding year is very much more slow in the Clyde forms. The most probable explanation of the latter phenomenon is that in the west coast gobies there is a true winter rest, accompanied by cessation from growth. This supposition has been illustrated graphically in the appendix to Table III. In this case the lines connect the points representing fishes caught at the same time; the points representing catches of fishes averaging 6.0 mm. and 5.4 mm. respectively only happen by chance to fall on one of the imaginary growth-lines, for they were added after these had been drawn. Other catches described in Table III. are also represented on the graph. The natural conclusion, from the data so far cited, is that the Clyde specimens of *G. minutus*, if not a distinct variety of the species, are at least a race which has a markedly different rate of growth at various periods of the year from that found on the east coast. It might be supposed that this western race seldom or never exceeded 60 mm.; but two specimens from Millport reach 67 and 70 mm. respectively. As the date of capture of the latter is not known, they have not been entered in Table III.

The rate of growth in the N.E. area agrees well with that deduced for St. Andrews Bay. The rate of growth per month during the first summer is slightly over 5 mm. Moreover growth seems to continue pretty vigorously during the winter months, for one specimen measuring 60 mm., probably from an early brood of the preceding year, was captured off Aberdeen in the middle of May. The appended graph agrees, too, with that illustrative of the forms of St. Andrews Bay, the lines of growth becoming slightly less inclined in the area representing the winter months. The rate of growth during the winter averages about 3 mm. per month. The range in size of fishes taken in October in this area is remarkable, the smallest being but 4.7 mm., while the largest is 36.0 mm. in length.

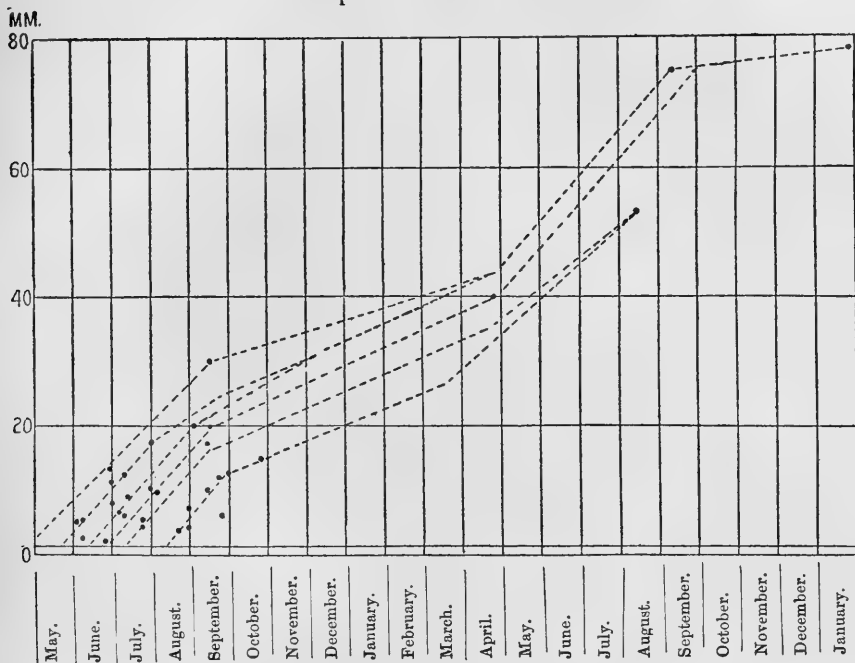
Four specimens of *G. minutus* were taken on 20/1/06 in the river Tay, four miles above the bridge. These measured 67, 65, 63, and 49 mm. respectively, and their age was probably about 20 months, though the smallest specimen may have been somewhat younger. Whether these forms would

have survived till the following summer is problematical; but it is possible that comparative freedom from competition and from the depredations of their enemies, due to their estuarine environment, allow these forms to enjoy a longer life than their neighbours in the sea. It may be added that a specimen of *G. minutus* measuring 85 mm., the largest in the collection, was captured in the waters of the Tay. There is no record of the date of capture of the latter; but it was found among a shoal of sprats. There is also another large specimen, date and locality unknown, which measures 82 mm.

Table I.—St. Andrews.

Date of capture.	No. of specimens.	Average length in mm.	Calculated age in months.	Condition.	Depth at which captured.
25/1/86	2	78.5	21	Adult.	Shallow bottom.
26/4/88	1	40.0	10	Nearly adult.	Mid-water.
7/6/89	25	5.0	$\frac{1}{2}$	Larval.	Bottom.
9/6/91	2	5.5	$\frac{1}{2}$	Postlarval.	Bottom.
9/6/91	5	2.8	$\frac{1}{4}$	Larval.	Bottom.
26/6/91	12	2.0	$\frac{1}{4}$	Larval.	Bottom.
28/6/86	3	13.6	2	Young.	Mid-water.
1/7/87	4	11.5	$1\frac{1}{2}$	Young.	Harbour.
2/7/88	4	8.0	1	Postlarval.	Bottom.
6/7/88	16	6.1	$\frac{3}{4}$	Postlarval.	Mid-water.
9/7/91	5	12.8	$1\frac{3}{4}$	Young.	Shallow bottom.
10/7/88	1	6.0	$\frac{3}{4}$	Postlarval.	Mid-water.
13/7/83	2	9.0	$1\frac{1}{4}$	Postlarval.	Mid-water.
22/7/91	7	5.2	$\frac{1}{2}$	Postlarval.	Bottom.
22/7/91	8	4.5	$\frac{1}{2}$	Larval.	Bottom.
31/7/89	10	9.6	$1\frac{1}{4}$	Young & postlarval.	Rock-pool.
31/7/89	10	17.2	3	Young.	Rock-pool.
4/8/88	16	9.8	$1\frac{1}{4}$	Postlarval.	Mid-water.
11/8/84	6	53.5	13	Adult.	Rock-pool.
21/8/88	4	3.8	$\frac{1}{2}$	Larval.	Bottom.
28/8/95	2	4.0	$\frac{1}{2}$	Larval.	
29/8/88	2	7.2	1	Postlarval.	Mid-water.
3/9/88	1	20.0	$3\frac{1}{2}$	Young.	Mid-water.
5/9/89	6	74.8	15	Adult.	Shallow bottom.
15/9/89	2	10.0	$1\frac{1}{2}$	Postlarval.	Mid-water.
19/9/89	1	30.0	$4\frac{3}{4}$	Young.	
19/9/89	8	17.2	$3\frac{1}{4}$	Young.	
17/9/88	1	20.0	$3\frac{1}{2}$	Young.	Mid-water.
22/9/88	11	12.0	$1\frac{3}{4}$	Young.	Mid-water.
26/9/88	1	6.0	1	Postlarval.	Mid-water.
1/10/91	4	12.7	2	Young.	Bottom.
24/10/95	24	14.5	$2\frac{3}{4}$	Young.	

Graph I.—St. Andrews.



Graph II.—Forth Area.

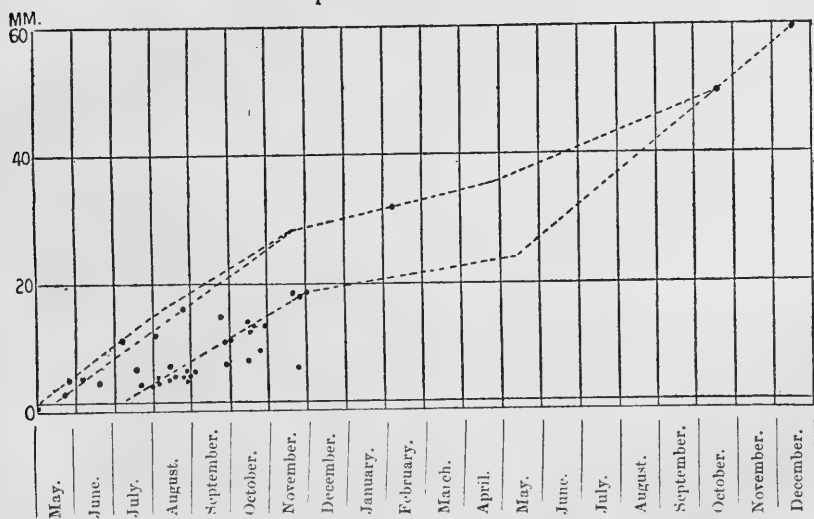


Table II.—Forth Area.

Date of capture.	No. of specimens.	Average length in mm.	Calculated age in months.	Condition.	Station and Depth.
9/2/95	1	32.0	9	Nearly adult.	V., —.
22/5/95	1	3.0	$\frac{1}{2}$	Larval.	I., —.
25/5/95	1	5.0	1	Larval.	VII., —.
2/6/92	5	5.2	1	Postlarval.	—, mid-water.
20/6/94	20	4.5	$\frac{3}{4}$	Larval.	—, surface.
7/7/91	63	11.6	$2\frac{1}{2}$	Young.	Alloa, bottom.
19/7/91	21	6.5	$1\frac{1}{2}$	Postlarval.	VI., bottom.
21/7/91	3	4.2	$\frac{3}{4}$	Larval.	IX., bottom.
31/7/90	10	4.2	$\frac{3}{4}$	Larval.	VII., bottom.
3/8/91	13	12.0	$2\frac{1}{2}$	Young & postlarval.	Alloa, —.
6/8/90	16	4.5	$\frac{3}{4}$	Larval & postlarval.	VIII., —.
6/8/91	8	5.0	1	Larval & postlarval.	VII., —.
13/8/91	10	7.3	$1\frac{1}{2}$	Postlarval.	V., bottom.
14/8/91	25	5.1	1	Larval & postlarval.	I., bottom.
17/8/91	9	5.5	1	Postlarval.	VII., bottom.
24/8/94	5	5.5	1	Postlarval.	III., bottom.
24/8/93	11	16.0	$3\frac{1}{2}$	Young.	III., bottom.
27/8/93	3	6.2	$1\frac{1}{2}$	Postlarval.	V., bottom.
29/8/94	3	5.0	1	Larval.	VIII., bottom.
30/8/93	9	5.9	$1\frac{1}{4}$	Postlarval.	VI., bottom.
4/9/90	5	6.2	$1\frac{1}{2}$	Postlarval.	IX., bottom.
24/9/93	2	15.0	$3\frac{1}{2}$	Young.	I., bottom.
29/9/93	12	7.6	$1\frac{3}{4}$	Postlarval.	IX., bottom.
29/9/93	1	11.0	$2\frac{3}{4}$	Very young.	VI., —.
1/10/91	4	11.2	$2\frac{3}{4}$	Young & postlarval.	V., bottom.
15/10/90	1	8.0	2	Postlarval.	II., bottom.
17/10/90	10	14.0	$3\frac{1}{2}$	Young.	III., bottom.
18/10/90	2	12.5	3	Young.	I., bottom.
19/10/91	11	13.6	$3\frac{1}{2}$	Young.	III., bottom.
20/10/90	5	49.8	17	Adult.	V., bottom.
24/10/91	4	9.5	$2\frac{1}{4}$	Postlarval.	V., bottom.
28/10/91	8	13.4	$3\frac{1}{2}$	Young.	VIII., bottom.
20/11/91	3	18.6	$4\frac{3}{4}$	Young.	III., bottom.
23/11/91	1	7.0	$1\frac{3}{4}$	Postlarval.	IX., bottom.
24/11/91	1	18.0	$4\frac{3}{4}$	Young.	V., bottom.
2/12/91	2	18.5	$4\frac{3}{4}$	Young.	—, —.
16/12/06	10	60.1	....	Adult.	—, —.

Table III.—Clyde Area.

Date of capture.	No. of specimens.	Average length in mm.	Calculated age in months.	Condition.	Station.
23/6/99	10	6.0	$\frac{1}{2}$	Larval & postlarval.	Strachur Bay.
14/9/99	10	57.2	16	Adult.	XIII.
17/9/01	2	50.5	$14\frac{1}{2}$	Adult.	L. Etive.
20/9/01	2	51.0	15	Adult.	L. Long.
7/10/99	10	38.9	$4\frac{1}{2}$	Young.	}
	6	59.0	$16\frac{1}{2}$	Adult.	
10/10/99	25	33.0	$3\frac{1}{2}$	Young.	}
	21	57.8	$15\frac{1}{2}$	Adult.	
10/10/99	12	34.5	$3\frac{2}{3}$	Young.	}
	4	57.2	$15\frac{3}{4}$	Adult.	
10/10/99	1	36.0	4	Young.	}
	7	58.0	16	Adult.	
—/10/09	3	49.2	15	Adult.	IX. Millport.

Graph III.—Clyde Area.

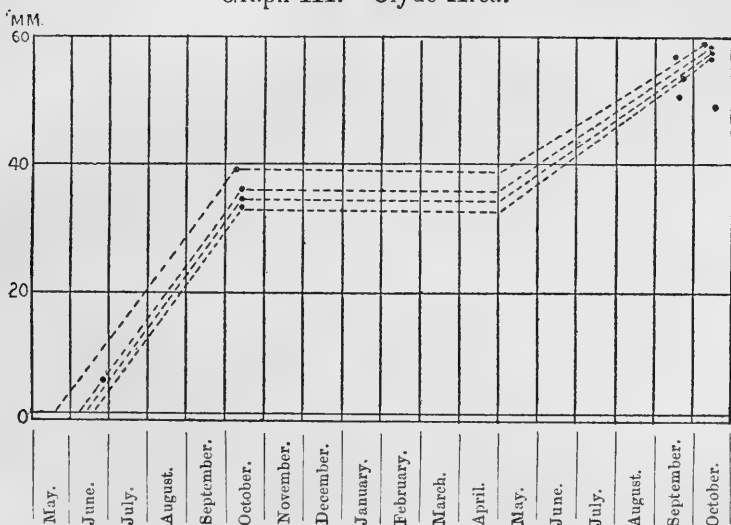
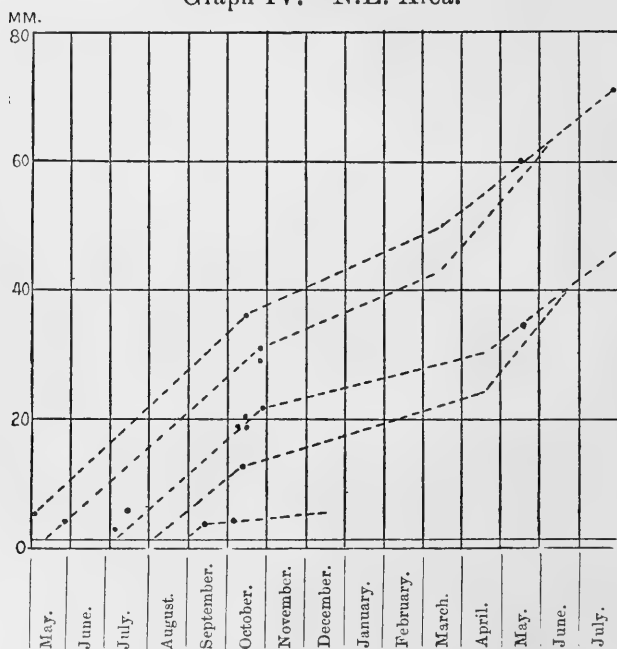


Table IV.—N.E. Area.

Date of capture.	No. of specimens.	Average length in mm.	Calculated age in months.	Condition.	Locality.
2/5/93	48	5.5	$\frac{3}{4}$	Postlarval.	IV., Moray Firth.
18/5/04	1	60.0	13	Adult.	Aberdeen Bay.
	8	34.3	10	Young.	
26/5/90	35	4.7	$\frac{1}{2}$	Larval.	Cromarty Firth.
3/7/94	13	3.5	$\frac{1}{4}$	Larval.	I., Moray Firth.
13/7/94	2	6.0	$\frac{3}{4}$	Postlarval.	X., Moray Firth.
25/7/90	1	71.0	15	Adult.	Smith Bank.
12/9/90	6	4.0	$\frac{1}{2}$	Larval.	V., Moray Firth.
4/10/94	1	4.7	$\frac{1}{3}$	Larval.	II., Moray Firth.
9/10/00	27	18.8	3	Young.	Aberdeen Bay.
11/10/94	4	13.0	$2\frac{1}{4}$	Very young.	XIV., Moray Firth.
12/10/94	2	20.2	$3\frac{1}{4}$	Young.	XV., Moray Firth.
	1	36.0	$6\frac{1}{4}$	Young.	Aberdeen Bay.
13/10/00	20	18.8	3	Young.	
23/10/00	15	29.0	$5\frac{1}{2}$	Young.	VI., Aberdeen Bay.
24/10/00	70	31.2	5	Young.	VII., Aberdeen Bay.
26/10/00	32	21.9	$3\frac{3}{4}$	Young.	III., Aberdeen Bay.

Graph IV.—N.E. Area.



Scales.

The scales of the species of gobies examined are invariably ctenoid; but as those of the various species differ in many respects from one another, they will be dealt with in turn later. The scales are always closely applied to the skin: they are slightly corrugated, but their margins are generally entire. Unfortunately the majority of the gobies in the collection were destitute of scales. Whether this was due to rough treatment in the trawl or to the action of the preservative in which the fish had been kept there is some doubt; but as there were usually a considerable number of loose scales in the bottles, the latter is the more probable cause. The fishes preserved in spirit retain their scales in a more satisfactory manner than those preserved in formaline.

The most striking feature about the scales of gobies is the uniform character of the concentric rings. These are very clearly marked from the youngest stages, and although many of the rings may be discontinuous or even intersecting in pairs, there is a mathematical precision about their arrangement which defies attempts to define the limit between summer and winter growths. Hoffbauer found that in the case of the carp the number of concentric rings representing a given period of growth did not vary much in scales taken from corresponding parts of the same fish. This is not so in the case of *G. minutus*, for on four adjacent scales of a 75 mm. specimen 32, 26, 18, 16 concentric rings were counted. Adjacent scales taken from examples of other species of *Gobius*, however, show but very slight variation in the number of concentric rings, especially in the younger stages. From the data given under the heading of the various species, it seems probable that there is absolutely no relation between the number of concentric rings on the scale of a goby and the length of the fish from which the scale was taken. In other words the number of rings on the scale is no criterion for estimating the age of a goby. Few, if any, writers on the subject ever put confidence in the number of rings on the scale as an aid to age identification in the larger fishes, but it seemed possible that in these short-lived forms an approximate relationship might be found. Hoffbauer cites the case of a carp, living under unfavourable conditions, whose scales showed a very even distribution of the concentric rings. That is to say, a fish which usually shows most clearly on its scales the varying width between the rings due to the varying conditions of environment, when transferred to uniform conditions of environment showed uniform width between the concentric

rings on its scales. Applying this argument to the subject of the present paper, it may be supposed that during the whole of their short life the gobies are more or less active, that they continue to grow uniformly, and correlative with this we find the even growth of their scales. It would be necessary to keep some gobies under observation during a complete year in order to prove the above hypothesis. When the otoliths are examined it will be found that there is in them an indication of the periods of growth characteristic of the better known food-fishes. Thus, there may be other causes at work which bring about the evenness of the concentric rings on the scales. The radial markings on scales have also been suggested as possible means for age determination. It has been observed by Cunningham*, and is evident in the present drawings from the scales of different species of *Gobius* (see Pl. IX. figs. 4-7), that the radial markings can be divided by their respective lengths (on the same scale) into two or more groups. The first group consists of those markings which reach, or nearly reach, the innermost concentric ring of the scale. The second group of markings terminates approximately at the concentric ring which formed the limit of the first season's growth. In larger fishes more groups are found; but, as might be expected, the gobies never show more than two series, indicating two periods of growth. It is in the cases of *G. niger* and *G. jeffreysii* that this arrangement of the radial markings is most accentuated; the markings on the scales of the 51 mm. specimen of *G. minutus* (Pl. IX. fig. 4) offer little evidence in this respect, and from the knowledge of this species it may be stated that the radial markings in all cases which have been examined offer as little help as the concentrics towards age determination.

In all cases the scales were taken from the side of the fish described, halfway between the anterior ends of the soft dorsal and anal fins, unless otherwise stated.

(1) *G. niger*.

Scales comparatively large, rarely more than 40 in a longitudinal row, 13-15 in vertical†, irregular square in outline, strong radial markings, teeth long compared to those on the scales of other gobies. A specimen taken in July and

* XXIII, Annual Report S. F. B. p. 125.

† These numbers, and those given for other species, are taken from Holt and Byrne, *op. cit.* The numbers have been verified where the individuals of any given species in the collection were in sufficient quantities.

measuring 61 mm. showed 55 and 56 concentric rings on adjacent scales (see Pl. IX. fig. 5). A form taken in the same month and measuring 58 mm. showed 60 and 65, while another measuring 52 mm. showed 72 concentric rings upon scales from the typical area.

(2) *G. friesii*.

Scales very large, only 28-29 in a longitudinal row, 8-9 in vertical, oblong in shape, with the teeth on the longer slightly convex side. The teeth are rather uneven in large (85 mm.) specimens; they have slightly swollen bases. The radial markings are pronounced and usually terminate in slight clefts in the side of the scale opposite to that which bears the teeth (see Pl. IX. fig. 6). The following table will bring out the fact that though the number of concentric rings is fairly constant for scales taken from the same part of the same fish, yet the numbers bear no relation to the size of the fish from which the scales were taken.

Date of capture.	Locality.	Length.	Number of conc. rings on adjacent scales.
10/10/99	Clyde.	mm. 81	97, 93
17/10/99	Clyde.	85	100, 95
10/10/99	Clyde.	87	80, 75

(3) *G. flavescens* (olim *ruthensparri*).

One of the small-scaled gobies, 35-40 scales in a longitudinal row, 12-15 in vertical. Roughly circular in outline, with a rather acute curve of the portion to which the teeth are attached. Teeth long and even, more symmetrical than those of other species. The smallest specimens from which scales were obtained measured 19 mm. Three scales taken from the typical area of a 25 mm. specimen each showed 10 concentric rings.

(4) *G. minutus*.

Scales very small and variable in number, upwards of 60, though often much less, in a longitudinal row, 13-19 in vertical. Outline elliptical, with the teeth placed along the

obtuse curve. Teeth small, with only a slight swelling at the base. Radial markings numerous. A scale of *G. minutus* is depicted in Pl. IX. fig. 4. Scales were obtained from specimens 18 mm. and 19.5 mm., but none were found on specimens 16–17 mm. In the young forms the concentric rings are very clearly defined, but in the larger specimens (50 mm. upwards) the rings are not so distinct, and many are discontinuous, while the innermost are much contorted. The following table will illustrate the fact that in this species the number of rings on adjacent scales varies excessively, nor is there any relationship between the size of a fish and the average number of rings on scales taken from the typical area.

Date of capture.	Locality.	Length.	No. of concentric rings.
		mm.	
6/2/90	Open sea.	32	9, 9, 10
		43	13, 13, 14, 14
		43	6, 6, 11, 11, 12, 12
5/9/89	Eden mouth.	64	25, 28, 34
		75	16, 18, 26, 32
		76	42, 46
—/10/09	Clyde.	45	15, 15, 17, 17, 18
		51	15, 16, 16
		51	12, 13, 14
13/10/00	Aberdeen.	28	4, 5, 6
		32	7, 7, 7
		32	6, 6, 7, 7, 7
25/1/86	St. Andrews.	81	39, 40, 40, 41, 41
		36	7, 8, 10, 11, 12
		55	20, 20, 22, 22
?	Clyde.	67	11, 15, 15
		70	19, 27, 27
		67	27, 32
?	?	67	

(5) *G. jeffreysii*.

Scales large, under 30 in a longitudinal row, and 7 in vertical. Broad and roughly rectangular: the long side on which the teeth are placed shows a marked convexity, the opposite side is considerably indented where the radial markings reach the edge of the scale. The teeth rather large and shaped like a retort, the points being directed inwards. The radial markings are well developed, and, in the scale figured in Pl. IX. fig. 7, can be divided into two distinct series. The concentrics are clearly marked and evenly distributed. On a scale of a 60 mm. specimen there were 50 rings.

Otoliths.

The otoliths can first be observed in specimens of *G. minutus* upwards of 4 mm. An otolith extracted from a 12 mm. form is figured in Pl. X. fig. 8, as seen by reflected light. At this stage the form is plate-like, and the concentric layers are visible under a low power of the microscope. In a form of 19 mm., mounted in balsam, the otolith can be seen very clearly; it is on a line with a point rather above the centre of the eye, and about a diameter of the eye from the outer edge of the latter. Pl. X. fig. 9 represents an otolith from a 33 mm. fish as seen by reflected light. The central portion is not very thick; then follows the denser growth of the summer and early autumn, and finally the thin growth of the late autumn.

From this point onwards the otoliths of *G. minutus* are concavo-convex in shape, and are so opaque that it is quite impossible in most cases to make out the internal structure. The otolith lies in the auditory capsule, placed slightly posterior to the eye; the convex surface is turned outwards. As has been stated before, when the fish had been preserved in formaline, the otoliths are either entirely absent or are merely represented by a mass of pulp. Difficulty was experienced in devising a method for observing the structure of the larger otoliths. Sectioning was tried with a scalpel, but in most cases only resulted in splitting the stone into fragments. Finally, a clean otolith was placed upon a glass slide and covered with a drop of melted wax. When the latter had hardened, the wax covering the convex surface of the otolith was carefully removed. A drop of dilute acid (HCl) was then applied to the exposed surface. By watching the action of the acid on the calcium carbonate under a low power of the microscope it was possible to check the process (with excess of water) when the otolith was sufficiently thin. The wax prevented the acid from attacking the sides of the otolith. The wax was removed by heating the slide gently over a Bunsen flame, and then washing with a few drops of xylol. During this process if the otolith had been worn down excessively it not infrequently broke up. It was then mounted in Farrant's Solution. This method of observing otolith-structure is not of much practical value, for much time is required for each observation and so many failures occur. It may further be questioned whether much reliance can be placed in results obtained in this way, for many of the markings may have been induced by the action of the acid. However, a series of

six sections of otoliths of *G. minutus* was obtained in this manner. The fishes from which they were taken form a representative sequence; particulars of their locality, size, and, most important in this connexion, their date of capture are noted in tabular form below. The drawings in Pl. X. were outlined by aid of the camera lucida and filled in by free-hand. The otoliths are all shown as seen by reflected light, so that the darker zones indicate thinner areas, and *vice versâ*. For the reasons above stated the inferences as to age determination by this method are not to be insisted on, but the results are given for what they are worth. Suffice it to say that they are, at least to some extent, in keeping with the conclusions arrived at by other methods—that is to say, that, in all probability, the growth of *G. minutus* continues throughout the year, but that there is a slight retardation during the winter months, which in the case of the Clyde specimens appears to amount to an actual cessation. Unfortunately, owing to being preserved in formaline, the otoliths of the Clyde specimens had not retained their normal composition.

Tabulated Results of Observations of the Otoliths of G. minutus.

Plate X. fig.	Date of capture.	Locality.	Length in mm.	Concentric markings.	Calculated period of life.
8.	9/7/91	St. Andrews.	12	Uniform.	Very young.
9.	6/2/90	Open sea.	33	} Thin central region, thick summer growth, and bordered with thin layer.	In the midst of retarded period of growth of first winter after hatching.
10.	6/2/90	Open sea.	45		
11.	11/8/84	St. Andrews.	51	} Thin central region, thick summer growth, thin growth of win- ter, thick zone.	In the midst of active growth of second sum- mer.
12.	11/8/84	St. Andrews.	58		
13.	5/9/89	St. Andrews.	64	} One thin zone on the central side of a half radius of the otolith.	Completing end of second summer's growth.
—	5/9/89	St. Andrews.	75		
14.	25/1/86	St. Andrews.	81	Two complete zones of growth, outermost half zone thin.	Approaching the end of the second winter's growth.

It will be seen from the above table that though the fishes were arranged in order of their respective lengths, the series of dates of capture falls into a natural sequence of itself. Further, that fishes of different lengths captured on the same date show a marked agreement in the structure of their otoliths. Another point in support of the age-determination by this method is the fact that the average diameter of the otolith, or part of an otolith, bordered by the first dark (thin) band is practically constant. From this it may be inferred that, at the end of the first winter's growth, the otolith of *G. minutus* reaches an approximately constant size; hence, that markings of the otoliths are at least an approximate clue to the age of the fishes which bear them. It will be seen from the drawings that the outline of the otolith is at first circular, but undergoes a series of changes by which it assumes the form of an irregular polygon, and finally in 80 mm. forms becomes roughly rectangular. In this connexion it is noteworthy that in several specimens about 65 mm. the otolith outline formed an almost regular pentagon; this is well shown in Pl. X. fig. 13.

Some Additional Notes on G. flavescens, Fabr.
(*olim ruthensparri*).

The breeding-season of this species continues over a considerable period—that is to say, from April or May to the end of August. In marked contrast to *G. minutus*, however, the young of very varied sizes, and probably of different ages, live together in shoals. This fact renders a definite idea of the rate of growth of the species almost impossible. In a haul made in Loch Gilp on 31/10/99 upwards of forty specimens of *G. flavescens* were taken, and these ranged in size from 12·5 to 27·0 mm.; moreover they formed a uniform series, the largest gap in which was 1·5 mm. In the same haul were four specimens ranging from 31·5 to 36 mm., and these differed very little in aspect from the largest of the first-mentioned series. In another haul made in the S.E. corner of St. Andrews Bay on 16/9/89 upwards of fifty specimens were taken, and these formed a series, with scarcely a break, from 9 to 32·5 mm. On 5/11/97 in Bressay Sound a series was obtained ranging from 20 to 32 mm. It was possible to make out the structure of the otoliths of the latter fishes, and they showed a dense growth surrounded by a thinner growth, indicating that the fishes were entering upon a period of retarded growth. All that can be stated with any

certainty from the above data is that 32–36 mm. is the limit of growth for the first season in *G. flavescens*.

Holt and Byrne give 64 mm. as the total length of a fully grown specimen of this species. The largest specimens in the collections under consideration only measure 42 and 44·5 mm. respectively. The former was captured on Smith Bank on 25/7/90, the latter on 28/5/96, locality not stated. It seems probable that larger examples of this species may exist off the east coast of Scotland, for a form 44·5 mm. at the end of May would doubtless attain a greater length before the close of the season. At all events it seems probable that maturity is reached during the spring or summer following the season in which the fishes were hatched. An interesting account of the life-history and habits of this species is given by Holt and Byrne *, from which the following paragraph is quoted:—"So far as any conclusions can be drawn from merely examining specimens of a species with such an extended breeding-season, it appears that members of this species do not ordinarily survive the second winter following the summer in which they are hatched." It is this "extended breeding-season" which renders equally problematical the rate of growth in *G. flavescens*. Reasons have been stated for taking April as the earliest month of spawning, and 34 mm. as the greatest *average* length attained at the close of the first season—that is, about the end of October. Supposing that the young forms are hatched at the end of April, and that they measure 1 mm. on hatching, the average rate of growth during the first season may be given approximately as $\frac{34-1}{6}$ or 5·5 mm. per month. The data are insufficient to offer even an approximation to the rate of growth for the second season. For instance, a specimen in the second season measures 44·5 mm. at the end of May; it may be asked, Is this one of the forms which reaches over 30 mm. in the preceding autumn, or one of those which only measures 10 mm. at the same period? The answer to such a question must be doubtful. To render the first case probable it is necessary to assume that there is in this species a winter rest of considerable duration; the second case would indicate that the rate of growth was little influenced by seasonal changes.

Dr. J. R. Tosh, in the notes which have been referred to, makes the following observation:—"The young are without the second spot below the first dorsal fin up to about 28 mm. From 30–32 mm. it begins to show faintly, and thereafter it increases in density. The spot shows well in forms 35–

* Irish Fisheries Reports, 1901, part ii. p. 50.

36 mm." This "second spot," placed below the middle of the spiny dorsal fin and posterior to the base of the pectoral, is said by Holt and Byrne to occur only in the male. As before stated, there are only two mature specimens of *G. flavescens* in the collection; these specimens both bore the second spot, and proved on dissection to be males.

EXPLANATION OF THE PLATES.

PLATE IX.

- Fig. 1. Larval *Gobius minutus* 2 mm. in length. $\times 42$.
 Fig. 2. Tail of postlarval *Gobius minutus* 7 mm. in length. $\times 42$.
 Fig. 3. Head of ditto. $\times 42$.
 Fig. 4. Scale from a specimen of *G. minutus* 51 mm. in length. $\times 24$.
 Fig. 5. Scale from a specimen of *G. niger* 61 mm. in length. $\times 24$.
 Fig. 6. Scale from a specimen of *G. friesii* 81 mm. in length. $\times 24$.
 Fig. 7. Scale from a specimen of *G. jeffreysii* 60 mm. in length. $\times 24$.

PLATE X.

- Fig. 8. Otolith from a specimen of *G. minutus* 12 mm. in length, captured in July. $\times 37$.
 Fig. 9. Ditto ditto 33 mm. in length, captured in February. $\times 37$.
 Fig. 10*. Ditto ditto 45 mm. in length, captured in February. $\times 37$.
 Fig. 11. Ditto ditto 51 mm. in length, captured in August. $\times 37$.
 Fig. 12. Ditto ditto 58 mm. in length, captured in August. $\times 37$.
 Fig. 13. Ditto ditto 64 mm. in length, captured in September. $\times 37$.
 Fig. 14. Ditto ditto 81 mm. in length, captured in January. $\times 37$.

XXXIII.—A Collection of Mammals from Eastern Buenos Ayres, with Descriptions of related new Mammals from other Localities. By OLDFIELD THOMAS.

(Published by permission of the Trustees of the British Museum.)

By the kind help of Mr. Ernest Gibson, Mr. C. H. B. Grant, already well known for his mammal collecting in S. Africa for the Rudd Exploration, has recently been enabled to spend a few months making a collection of mammals and birds for the British Museum at the former's ranche "Los Yngleses," in the eastern part of the Province of Buenos Ayres.

This region has not hitherto been represented in the Museum by any modern specimens except a few collected by myself in 1896 at La Plata, about 120 miles N.N.E. of the

* N.B.—The otoliths from this onwards were subjected to treatment with acid (HCl).

present locality, which is in the district of Ajó, inland of Cape San Antonio, halfway between La Plata and Mar del Plata.

Eighteen species are represented, and though it might have been supposed that the region was well known, so many points of interest have cropped up that I have thought it best to give a complete list of the collection, besides describing such new forms from other localities as have become apparent during the process.

1. *Nycteris* * *cinerea villosissima*, E. Geoff.

♂. 2082, 2083 ; ♀. 2064, 2088.

Dr. Allen has again † revived the question of the identification of the "Chauve-souris septième" of Azara, which in 1901 I assigned to the Paraguayan representative of the *cinerea* group, and he later in the same year to the *borealis* group. On my reaffirming my opinion he has produced a new theory—that Azara's bat was not a *Nycteris* (*Lasiurus*), but a *Dasypterus*, probably my *D. ega argentinus*.

While admitting that this theory has a little more plausibility than the *borealis* view, I am not disposed to abandon my original opinion, for several reasons.

Firstly, if the two theories were of exactly equal probability (and even this I do not think is the case) the *cinerea* identification should be adhered to as having been the first made by an author who had duly considered the whole subject.

Secondly, the reputed absence of *cinerea* from Paraguay cannot be really correct, since it occurs both to the north and south of that country, as I knew when making the identification. Dr. Allen would seem to have been ignorant of this fact.

Thirdly, Dr. Allen seems to have been influenced by Rengger's account of his "*villosissimus*"; but that is entirely immaterial to the discussion, as Geoffroy's name is based solely on Azara's description.

The border of the interfemoral of these southern specimens of *cinerea* is not hairy, and Azara's description of the colour appears to me more applicable to the present bat than to the *Dasypterus*.

"Found hanging in Tala tree in monte."—C. H. B. G.

* *Lasiurus auctorum*. See Miller, P. Biol. Soc. Wash. xxii. p. 90 (1909).

† Mamm. S. Patagonia, p. 188 (1905).

2. *Myotis nigricans*, Geoff.

♂. 2051, 2096, 2103.

2 ♂, 1 ♀ in spirit.

"Caught in house at night."—C. H. B. G.

3. *Felis geoffroyi*, D'Orb.

♂. 2086, 2087, 2095 (juv.); ♀. 2075.

4. *Canis azaræ*, Wied.

♂. 2069, 2072; ♀. 2070, 2073.—All young.

5. *Conepatus gibsoni*, sp. n.

♂. 2056; ♀. 2057, 2058.

Two young in spirit.

Size about as in *C. chinga* and *feuillei*, therefore distinctly larger than in *C. suffocans* and *proteus*. Fur coarse, as in the other Argentine species, very different from the soft fur of *C. humboldti*. White lines distinct, well defined, about half an inch broad anteriorly, and posteriorly broadening to about an inch on the back; separate from each other on the crown; continued backwards over the hips and passing boldly on to the sides of the tail, on the lower side of which they sometimes coalesce. In *C. chinga* they are united on the crown and almost or quite die away in passing over the rump, though they reappear on the sides of the base of the tail. In *C. feuillei* also they are joined on the crown, but quite dwindle away before reaching the tail. Tail black above for its basal three inches, then with a large heavy tuft of hairs, which are mostly wholly white, but among which, especially at the tip, there are some that are white basally and black terminally. Such two-coloured hairs are not present in the most nearly allied species, but are characteristic of *C. humboldti* and *C. suffocans*.

Dimensions of the type (measured in the flesh):—

Head and body 331 mm.; tail 188; hind foot 54; ear 24.

Skull: condylo-basal length 67 (that of a male 73.5); zygomatic breadth 44; palatal length 28; front of canine to back of m^1 20.6.

Type. Old female. B.M. no. 9. 12. 1. 18. Original number 2058. Collected 6th October, 1908.

This skunk is readily distinguishable from *C. proteus* and *suffocans* by its larger size, from *C. chinga* and *feuillei* by its stripes not coalescing on the forehead and by their even

continuance over the rump and on to the sides of the tail, from *C. humboldti* by its coarser fur, and from all except *C. humboldti* and *suffocans* by the two-coloured hairs in its heavily tufted tail.

I have named this fine animal in honour of Mr. Ernest Gibson, to whose help and hospitality the making of this interesting collection is due.

"Caught in hollow tree in monte."—*C. H. B. G.*

6. *Holochilus darwini*, Thos.

♂. 2109 (imm.); ♀. 2108, 2110 (yg.).

In spirit from Mr. Gibson's collection—two males, 62 *a* and *b*, immature and very old respectively.

The old male skull taken from 62 *b* shows a remarkable superiority in size over the adult female, 2108, but the difference seems to be characteristic of some at least of the species of this genus. Darwin's type from Bahía Blanca is a female.

All the specimens agree in having fulvous bellies, and differ therein from the Panama and La Plata *H. vulpinus*.

7. *Oryzomys flavescens*, Waterh.

♂. 2053; ♀. 2052.

"Trapped in hollow tree in monte."—*C. H. B. G.*

8. *Eligmodontia laucha*, Desm.

♀. 2102.

"Caught in esparto grass."—*C. H. B. G.*

9. *Akodon arenicola*, Waterh.

♀. 2111, 2112.

"Burnt out of reed-bed."—*C. H. B. G.*

10. *Ctenomys talarum antonii*, subsp. n.

♂. 2060, 2080, 2081; ♀. 2062, 2067, 2068, 2071, 2079, 2107, 2113.

Adult and two young in spirit.

Longer tailed, paler, and with more white on the under surface than in true *talarum*.

Size as in *talarum*. Colour of head and back generally paler, most specimens near "isabella," the dorsal area little blackened. In *talarum* the dorsal hairs are heavily blackened terminally and the frontal region is prominently deep black, this colour being only present in one out of the ten Ajó

specimens. Under surface pale "wood-brown," not so creamy as in *talarum*; marked white patches present in the axilla, on the inner sides of the hips, and on the centre of the inguinal region; in *talarum* a minute axillary patch is alone present. Tail markedly longer than in *talarum*, brown above, paler below.

Skull very much as in *talarum*, but distinct parietal masseteric ridges are perceptible, which is not the case in *talarum*.

Dimensions of the type (measured in the flesh):—

Head and body 174 mm.; tail 70; hind foot 28.

Skull: condylo-basal length 41.5; zygomatic breadth 25.5; nasals 14×6.8 ; interorbital breadth 9.2; mastoid breadth on lips of meatus 25; upper molar series (alveoli) 9.5.

Type. Adult male. B.M. no. 9. 12. 1. 29. Original number 2081. Collected 14th December, 1908.

This Tuco-tuco differs so much on the average from the form which I found at La Plata that it should apparently be distinguished subspecifically. The colour characters are not absolutely constant, one specimen in ten having a black frontal region and darkened back, while one example of *talarum* has the brownish under surface of *antonii*. In tail-length the Ajó form measures from 61 to 70 mm., while in the La Plata animal the tail is 52–57 in length.

From *C. azarae*, the Tuco-tuco of the Central Pampas of Buenos Ayres Province*, *C. talarum*, in either subspecies, is readily distinguishable by its much narrower bullæ.

"Ploughed out in sandy potrero." "Caught running about in garden."—*C. H. B. G.*

The following *Ctenomys* also seems to need description:—

Ctenomys fodax, sp. n.

Allied to *Ct. osgoodi*, Allen †, but rather larger and with various cranial differences.

Size among the largest of the genus. Fur rather softer and looser than in *osgoodi*. Colour above varying from pale cinnamon to isabella, but averaging more cinnamon than in the allied species. Tail and hind feet both longer than in that animal, but owing to the want of good flesh-measurements the difference cannot be very exactly stated.

* Cf. Ann. & Mag. Nat. Hist. (7) xii. p. 243 (1903).

† *Ct. robustus*, Allen, Bull. Am. Mus. N. H. xix. p. 185 (1901); Mamm. Southern Patagonia, p. 38, 1905 (*nec* Phil.). *Ct. osgoodi*, id. Mamm. S. Pat. p. 191 (footnote).

Skull rather larger and more bowed than in *Ct. osgoodi*. Nasals broad in front, ranging in eleven specimens from 9 to 10 mm. in greatest breadth, as compared with 7·8 in the broadest of five specimens of *osgoodi*; in correlation with this the whole muzzle is broader; posteriorly the nasals extend almost or quite as far backwards as the fronto-premaxillary processes, while in *osgoodi* the latter processes always noticeably surpass the nasals. Height of crown above alveolar margin about 17 mm. as compared with 15·5 in *osgoodi*. Top of brain-case with the projecting piece of the bullæ which appears on the upper surface on each side of the interparietal quite small (1–3 mm. in diameter) and distant from the transverse occipital crest by at least its own diameter, while in *osgoodi* this is larger (4–5 mm.) and is carried close up against the front side of the crest. Interparietal longer than broad, the converse being the case in *osgoodi*—commonly divided by a median suture.

Dimensions of the type (measured in skin) :—

Head and body (apparently stretched) 260 mm.; tail 98; hind foot (s. u.) 40·5.

Skull: condylo-basal length 57·5; greatest breadth 33·7; nasals $24 \times 9\cdot5$; interorbital breadth 10·5; least breadth across brain-case 18·2; posterior breadth on ridge behind meatus 30·3; upper molar series (alveoli) 12·5.

Hab. Valle del Lago Blanco, Cordillera region of Southern Chubut, Patagonia (about 46° S., 71° W.).

Type. Adult male. B.M. no. 3. 7. 9. 66. Collected 15th August, 1899, by J. Koslowsky. Thirteen specimens examined.

The species to which this *Tuco-tuco* is most nearly allied, *Ct. osgoodi*, was obtained during the "Princeton University Expedition to Patagonia" on the Upper Rio Chico, rather more than two degrees south of the above locality. Two topotypical specimens of it were presented to the British Museum by the authorities of the United States National Museum, and I have now been permitted the loan of three further specimens for the purposes of the present description. I have therefore had five examples of *Ct. osgoodi* for comparison with thirteen specimens of *Ct. fodax*, and find the above distinctive cranial characters to be entirely constant.

The relations of *Ct. osgoodi* with the *Ct. magellanicus* of still further south are still not very clear, as no satisfactory series of the latter has yet been collected. But I suspect that the two are exceedingly closely allied.

11. *Myocastor coypus*, Mol.

♂. 2054, 2077, 2078 (juv.); ♀. 2076.

12. *Lagostomus maximus*, Blainv.

♂. 2084; ♀. 2104, 2105.

These are typical Argentine Viscachas, and agree with other specimens from localities south of 30° S. latitude.

But four examples from Tucuman differ from them in the quality of their fur and in the structure of their palates, and may be subspecifically separated as follows:—

Lagostomus maximus immollis, subsp. n.

Size a little larger than in true *maximus*. Fur comparatively harsh and coarse, with much less underfur, especially on the rump, where it is scarcely richer than on the rest of the body. In *maximus* the rump is clothed with a thick coat of woolly underfur nearly 30 mm. in length. The specimens, having been killed in September, would be in full winter fur, while some of the woolliest specimens of *maximus* are in summer fur (December). General colour a rather browner grey than in *maximus*, but no stress can be laid on this.

Skull like that of *maximus*, except that the palatal foramina are distinctly broader (more than 3.6 mm. in breadth in all specimens of *immollis*, less than 3.4 mm. in all of *maximus*) and distinct incisive foramina are always present, 1.6 mm. in breadth or more, these being commonly absent or quite minute in *maximus*.

Dimensions of the type (measured in flesh):—

Head and body 470 mm.; tail 180; hind foot 130; ear 55.

Skull: condylo-basal length 114.5; greatest breadth 73; nasals 54.5 × 21; breadth between outer corners of anteorbital foramina 54; least interorbital breadth 32; front of parietals to back of occipital crest 31.5; breadth of incisive foramen 1.7; palatal foramina 12.6 × 4.7; length of upper molar series (crowns) 26.5.

Hab. Tapia, Tucuman. Alt. 700 m.

Type. Adult male. B.M. no. 3. 6. 6. 11. Original number 1875. Collected 17th September, 1902, by L. Dinelli. Presented by Oldfield Thomas. Four specimens.

Furthermore the Museum contains the skull of a *Lagostomus* which was obtained in Peru by Mr. Kalinowski, by whom it was found buried in sand.

No Viscachas of this genus are known to live in Peru, and

the animal is probably now extinct, but the skull is in no way fossilized, and indicates that these animals lived in Peru at a very recent date.

The species may be called

Lagostomus crassus, sp. n.

Size larger and form stouter than in *L. maximus*. Skull stout and heavy, larger in all dimensions than the largest male skull of that species, the anterior frontal region particularly broad, convex upwards; breadth across anteorbital foramina much exceeding that in *L. maximus*. Incisive foramina minute; palatal foramina large.

Dimensions of the typical skull:—

Condyllo-basal length 122.5; greatest breadth 82.6; nasals 54.5×25 ; breadth between outer corners of anteorbital foramina 63; least interorbital breadth 36.7; front of parietals to back of occipital crest 39.5; palatal foramina 14×4.3 ; length of upper molar series (crowns) 28.

Hab. Santa Ana, District of Cuzco, Peru.

Type. Adult skull without skin. Sex unknown. B.M. no. 97. 10. 3. 16. Collected by J. Kalinowski.

The material difference in size between this skull and that of the Argentine Viscacha is evident on comparing its measures with those of the type of *L. m. immollis*, the largest male *L. maximus* skull in the Museum collection.

13. *Cavia rufescens pamparum*, Thos.

♂. 2090, 2097, 2098, 2099; ♀. 2100, 2101.

Additional material only serves to increase the difficulty and complexity of the problem as to the species and subspecies which should be admitted in the restricted genus *Cavia*. The present set average rather larger than most *C. "rufescens,"* and approach examples of *C. aperea*.

[*Lepus europæus*, Pall.

♀. 2094.

"Shot in sandhills along coast."

The European hare is evidently now acclimatized in this region, as Mr. Grant makes no note as to its recent introduction.]

14. *Blastocerus bezoarticus*, Linn.

♂. 2091, 2106; ♀. 2066, 2092.

As pointed out by Mr. Lydekker, the name *bezoarticus* of

Linnæus, dating from the tenth edition of the 'Systema,' should clearly replace the more familiar name *campestris* for the Pampas Deer.

15. *Pontoporia blainvillei*, Gray.

Skull picked up on sea-coast.

16. *Dasyus villosus*, Desm.

♂. 2074.

17. *Didelphis paraguayensis*, Oken.

♂. 2060, 2065; ♀. 2055, 2059, 2061.

18. *Lutreolina* (g. n.) *crassicaudata*, Desm.

Didelphis or *Metachirus crassicaudata* auct.

♂. 2093.

I take this opportunity to give a special generic name to the Thick-tailed Opossum, whose many peculiarities, external and cranial, amply entitle it to that distinction. Its characteristics are fully described in the 'Catalogue of Marsupials.'

XXXIV.—Remarks on Prof. L. von Méhely's recent Contribution to the Knowledge of the Lizards allied to *Lacerta muralis* *. By G. A. BOULENGER, F.R.S.

THE first part of Prof. von Méhely's work on the Wall-Lizards, which, as the author announced a few years ago †, is intended to lead to the much desired solution of the perplexing problem of the distinction, definition, and phylogeny of the species of this interesting group, has at last appeared; and I cannot refrain from offering a few critical remarks on a piece of work which, valuable as it proves to be for the mass of information it contains, although somewhat disappointing with regard to the study of the variations of the skull ‡, has,

* Ann. Mus. Hung. (Budapest) vii. 1909, p. 407 (received Jan. 1910).

† Op. cit. v. 1907, p. 84 and p. 469.

‡ In a previous contribution in reply to my criticisms (1907, p. 471) Prof. v. Méhely observed, as regards the specific characters of the skulls: "Freilich ist es nöthig von mancher Art ein Dutzend und mehr Schädel zu präpariren um das wahrhaftig Charakteristische herauszufinden, da die Schädelknochen in demselben Maasse variiren, wie jedes andere Organ." I was therefore under the impression that his knowledge of the specific

in my opinion, and as I expected from the author's preliminary publications, failed in its object.

I will merely allude again to our differences of opinion as to the probable derivation of the various forms dealt with. I have already expressed my views on this matter*, and I see no reason to alter them. I adhere to the general lines first laid down by Eimer, whilst Prof. von M  hely would reverse the series, considering the reticulate platycephalous types as the more primitive, from which the striated pyramidocephalous are derived. He now even postulates a derivation of the Wall-Lizards from pristidactyle types with transparent lower eyelids, whilst I would regard the latter as representing specialization from liodactyle types with opaque eyelids. Mountain forms of these lizards he regards as relics of a former epoch, whilst I would look upon them, in most cases at least, as modifications of the forms of the plain, in the same way as *Salamandra atra* is surely derived from *S. maculosa* or some form closely related to it, and not the reverse. I am strongly of opinion that *L. bedriag  * and *L. sardoa* are more nearly related to the forms now living in Italy, Elba, Corsica, and Sardinia than to any others, and bear no close genetic relationship to *L. oxycephala* or other platycephalous forms of S.E. Europe, whilst *L. monticola* (a variety of *L. muralis* which Prof. v. M  hely regards as a species) is derived from the *L. muralis* of Spain and Portugal, its similarity to *L. horvathi* and *L. saxicola* being an example of convergence.

Reserving for a future occasion a full discussion of these questions, I will only observe at present that the phyletic considerations which have guided the author in regarding the "Schwesterformen" *L. danfordi* and *L. anatolica* as valid species have not been logically applied to *L. bedriag  * (*reticulata* of M  hely) and *L. sardoa*, which, from his own remarks, seem to stand in exactly the same relation to each other. The author, it may be noted, no longer regards *L. sardoa* as simply identical with *L. bedriag  *.

characters of the skulls rested upon the study of a large material, and now I am greatly surprised to find that for 21 forms dealt with in this contribution he has only examined 47 skulls altogether, and of one only as many as 9; in 9 cases he has prepared only 1 skull, and in 3 he has not seen the skull at all. Only of 4 forms has he seen more than 3 skulls. This is not quite in accordance with what his previous statement led us to expect, and if it is true that, as he himself says, the cranial bones vary as much as any other organ, more skulls should have been studied.

* Ann. & Mag. Nat. Hist. (7) xx. 1907, p. 39, and P. Z. S. 1908, p. 1063.

These are after all only matters of opinion, based on theoretical conceptions, but I must enter a protest against the manner in which the author has changed his definitions of the primary groups into which he divides the Wall-Lizards, without even alluding to the position previously taken up by him and which I showed to be untenable. Thus, in his first paper, to which I replied, he laid great stress on the shape of the skull, whether platycephalous or pyramidocephalous, for the grouping of species, and although admitting that a number of forms did not fit absolutely in his definition of the two groups, a definition which is too long for me to reproduce here, he placed in the former, as "rein platycephale Arten," *L. saxicola*, *L. caucasica*, *L. derjugini*, *L. horvathi*, *L. mosorensis*, *L. oxycephala*, and *L. hispanica*; and in the latter, as "rein pyramidocephal," *L. tiliguerta*, *L. fumana*, *L. ionica*, *L. peloponnesiaca*, *L. lilfordi*, *L. taurica*, and *L. jacksonii*. As forms not agreeing completely with the definition of either, as taking a "Mittelstellung," *L. anatolica*, *L. danfordi*, *L. græca*, *L. reticulata* (*bedriagæ*), *L. laevis*, *L. muralis*, *L. praticola*, *L. vivipara*, and *L. boettgeri*. I then expressed the opinion that such an arrangement was most arbitrary, pointing out that the figures of two extreme types of skulls, which were selected to accompany Prof. v. M  hely's paper, conveyed a false impression of the real state of things in this genus, and observing that I could easily lay out a series that would to such an extent bridge over the differences as to show of how little practical value they are for the definition of species. I think all who will compare the two figures given by Prof. v. M  hely in his first contribution with the series depicted in the paper with which I am now dealing will admit that my objections are fully borne out. I wish particularly to request a comparison of figs. 1 and 3 on pl. iii. of the first paper, representing a "rein platycephal" type, with figs. 5 and 6 on pl. xiv. and of the figure on pl. xvii. (representing three skulls of the same species) of the latest paper, in view of the criticism I offered as to the division into platycephalous and pyramidocephalous forms. But now all is changed. The definition of the Arch  olacert  , which barbarous name replaces to some extent that of the platycephalous group, contains nothing more than a vague and inaccurate allusion to the shape of the skull; the large size of the nasal apertures, and other cranial characters, with the exception of the supra-ocular fontanelle, which were formerly regarded as diagnostic of the groups, are now used merely to define so-called species. It will also be noticed that one of the species (*L. hispanica*) formerly included among the "rein platycephal" no longer

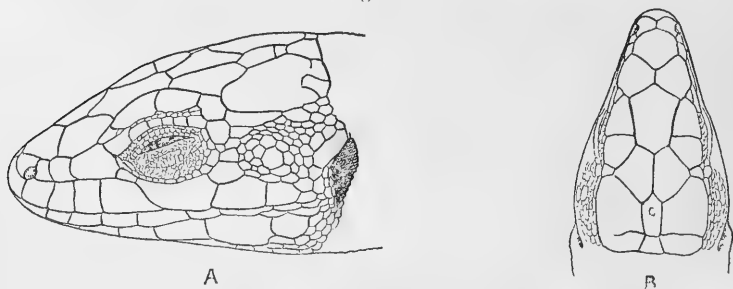
appears among them, and is intended, I infer, to be dealt with under the Neolacertæ, which corresponds on the whole to the pyramidocephalous forms of Méhely's first paper. But not a word occurs to explain this extraordinary contradiction.

I will now give a translation of the new definition of the group Archæolacertæ, appending a number to each character in order to facilitate criticism :—

“Oxy-platycephalous forms (1), in which the outer border of the parietal shield is more or less emarginate by a wedge-shaped first supratemporal (2). Between the supraoculars and the supraciliary mostly a complete row of granules (3). The suture between the first and second supraciliaries vertical to the supraciliary arch (4). Caudal scales forming alternately long and short verticils (5). A distinct sensory pit on the hind border of each upper caudal scale (6). Lamina supraciliaris (supraocular osteo-dermal plates) usually with a membranous fontanelle (7). Livery mostly reticulate (8).”

What are these characters worth? Not one of them can be regarded as distinctive of the group Archæolacertæ as opposed to the Neolacertæ, as I will show.

Fig. 1.



Heads of *Lacerta muralis*, var. *campestris* (A), from Sansego Island, and *L. muralis*, f. *typica* (B), from Vöslau, near Vienna.

(1) By “oxy-platycephalous” is evidently meant a pointed snout and a very flat head. Now *L. horvathi* (Archæolacerta) has a broader blunter snout than an average typical *L. muralis* (Neolacerta) and the heads of *L. danfordi* and *derjugini* (Archæolacertæ) are less flattened than those of many Neolacertæ (*L. muralis* typ., *L. tiliguerta*, *L. hispanica*, &c.).

(2) I append a figure of a head of a *L. muralis*, var. *campestris*, from Sansego Island, Istria, to show that some Neolacertæ may agree with the definition of the Archæolacertæ,

whilst I would refer the reader to fig. 1, pl. xvi. of Prof. v. Méhely's paper to show that exceptions to this character occur among the Archæolacertæ. Besides, I have already pointed out elsewhere very frequent exceptions in both groups. In my paper in the 'Transactions of the Zoological Society' (xvii. 1905) I have carefully recorded them on account of Prof. v. Méhely's statement (Ann. Mus. Hung. ii. 1904, p. 368, footnote) "Ich habe z. B. viele Hunderte von sehr verschiedenen Fundorten herstammende Exemplare der *Lacerta muralis*, *L. vivipara* und *L. taurica* untersucht und niemals ein Exemplar angetroffen, bei dem das erste Postoculare [upper postocular] nicht an das Parietale angestossen hätte." Is it not very remarkable that when I examine scores instead of hundreds of the typical form I come across such exceptional specimens? Recently on looking over 135 typical *L. muralis* from Spain, I found 23 such exceptions, or nearly 18 per cent. A specimen here figured (fig. 1 B) is from near Vienna. In a recent reply to my criticisms (Ann. Mus. Hung. v. 1907, p. 488) Prof. v. Méhely maintains his statement, and thinks he can explain the exceptions I have pointed out by suggesting that I have been deceived in my examination by an occasional division of the last supraocular. How can anyone believe that in such a case I would have reckoned a specimen as not falling into Prof. v. Méhely's definition? I will let the above figures, traced from photographs, speak for themselves. Besides, it is an incontrovertible fact that *L. bedriagæ* (Archæolacerta) and *L. tiliguerta* (Neolacerta) are absolutely identical as concerns the character in question.

(3) Here again I need only refer the reader to Prof. v. Méhely's own description and figures (pl. xxi.), and to my memoir of 1905, where I have mentioned innumerable exceptions to the character which I take to be implicitly held by the author as diagnostic of the Neolacertæ in opposition to the Archæolacertæ.

(4) I have before me examples of Palæolacertæ (*L. deverfordi*, *bedriagæ*, and *mosorensis*, for example) in which the suture in question is oblique, whilst, on the other hand, I find many *L. muralis*, typ., which answer to the definition of the Archæolacertæ. How much the direction of this suture varies may be seen from the author's figures on pl. xxi.

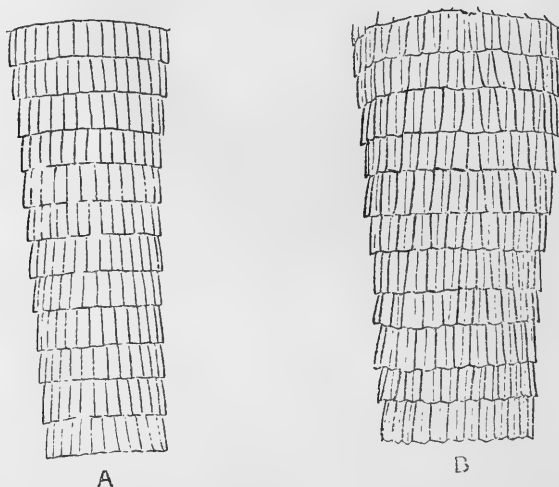
(5) The annexed figures of the scaling of the tail (in anterior third), traced from photographs, of an Archæolacerta (*L. græca*) and a Neolacerta (*L. muralis*, typ.) suffice to put aside a character to which undue importance is attached, although I could bring forward many other instances. I notice that in his descriptions of the species of Palæolacertæ

Prof. v. M  hely sometimes refers to the character as being "wenig auffallend." But, then, why does he use it in the diagnosis of the group, without a word as to there being exceptions?

(6) The sensory pits vary much in distinctness on the head and tail according to individuals in the typical *L. muralis*. On the other hand I cannot find a trace of these pits on the tail of some individuals of *L. bedriag  * and *L. sardoa* (Arch  olacert  ), where, according to the author, they are only "mehr oder weniger auffallend," an expression which surely applies also to some of his Neolacert  .

(7) See Prof. v. M  hely's own descriptions and figures as regards the Arch  olacert  . I have already mentioned finding the fontanelle in adult *L. muralis*, var. *tiliguerta*, *lilfordi*, and *fumana* (Neolacert  ).

Fig. 2.



Scaling of upper surface of tail (in anterior third) of *Lacerta danfordi*, var. *gr  ca* (A), from Lada, Taygetos Mts., and *L. muralis*, f. *typica* (B), from Bosnia.

(8) *L. muralis*, var. *nigriventris*, always pertains, even when very young, to the reticulate type, which is also met with in the var. *brueggemanni*, *bocagei*, &c., all Neolacert  , whilst *L. horvathi* (Arch  olacerta) agrees very closely in markings with the striped individuals of *L. muralis*, typ., as Prof. v. M  hely knows perfectly well. I have just had photographs taken of a *L. m.*, var. *tiliguerta*, and a *L. m.*, var. *bedriag  *, which are absolutely identical in markings.

I can quite understand a systematist using characters which suffer occasional exceptions, provided they are conscientiously mentioned; but when the exceptions are so frequent and striking as they prove to be in the case of the two groups opposed to each other, the course followed by Prof. v. Méhely seems to me unjustifiable.

More astonishing still, if it may be, is the choice of characters by which the key to the species is constructed. This key I have translated literally, only following a different typographic arrangement in order to render it more easily readable:—

I. Two superposed postnasal ("nasofrenal") shields.

A. A series of small shields on the posterior border of the anal.

Rostral separated from the nostril by a small subnasal; ventral plates in 8 longitudinal series

L. anatolica, Werner.

Rostral entering the nostril; ventral plates in 6 longitudinal series

L. danfordi, Gthr.

B. No small shields on the posterior border of the anal.

1. Occipital shield considerably larger than the interparietal.

L. laevis, Gray.

2. Occipital smaller than the interparietal.

a. Rostral not in contact with the frontonasal ("internasal"); first supraocular usually in contact with the frontal.

No masseteric shield; each of the scales of the two middle rows of subcaudals somewhat broader than the neighbouring ones

L. græca, Bedr.

Usually a distinct masseteric shield; each of the scales of the two middle rows of subcaudals nearly twice as broad as the neighbouring ones

L. oxycephala, D. & B.

b. Rostral always in contact with the frontonasal; first supraocular not in contact with the frontal.

L. mosorensis, Kolomb.

II. A single postnasal.

A. Rostral always forming a rather long suture with the frontonasal.

Collar with straight edge; upper caudal scales truncate behind; femoral pores forming a complete series

L. horvathi, Méhely.

Collar distinctly dentate; upper caudal scales pointed behind; femoral pores forming a short series, vanishing outwards

L. derjugini, Nik.

B. Rostral not touching the frontonasal or forming at most a short suture with it.

1. Usually no masseteric shield; outer border of parietal shield usually but slightly notched by the first supratemporal; upper caudal scales keelless

L. reticulata, Bedr.

2. Usually a distinct masseteric shield; outer border of parietal shield usually strongly notched by the first supratemporal; upper caudal scales distinctly keeled longitudinally.

a. Collar distinctly dentate; upper caudal scales pointed behind.

Dorsal scales smooth *L. caucasica*, Méhely.

Dorsal scales distinctly keeled *L. boettgeri*, Méhely.

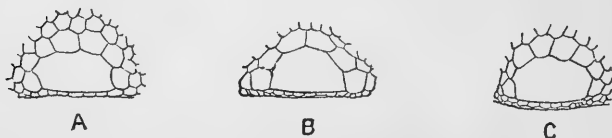
b. Collar with straight edge; upper caudal scales truncate behind *L. saxicola*, Eversm.

In division I (two superposed postnasals) we find *L. mosorensis*, in which there is frequently a single postnasal. Out of 12 specimens in the British Museum, received from Prof. Kolombatovic, the describer of the species, 5 have a single postnasal.

In division II (a single postnasal) I find, as I have already mentioned, and as Prof. v. Méhely knows, two postnasals in about 20 per cent. of the *L. reticulata* (*bedriaga*) examined.

IA is opposed to IB on a character of small importance which I find as well developed in most specimens of *L. græca* as in *L. danfordi*, whilst indications of it are to be seen occasionally in other lizards of the *L. muralis* group. I here figure (traced from photographs) the anal region in one of the types of *L. danfordi*, in a *L. græca* from Taygetos (received from Mr. Lorenz Müller), and in a *L. muralis*, var. *serpa*, from the Faraglioni.

Fig. 3.

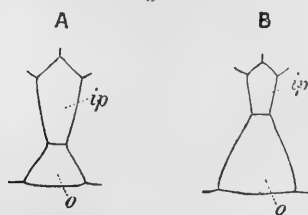


Præanal region of *Lacerta danfordi*, type (A), *L. danfordi*, var. *græca* (B), from Kambos, and *L. muralis*, var. *serpa* (C), from the Faraglioni near Capri.

L. anatolica is separated from *L. danfordi* as having the rostral separated from the nostril by a small shield and 8 rows of ventrals. The first character has no importance whatever, as shown by *Latastia coppadocica* (although formerly appealed to by v. Méhely as one of the generic characters of *Apathya*) and other species, in which it is admitted by the author himself to be inconstant, whilst the second is disposed of by the fact that two of the types of *L. danfordi* in the British Museum have 8 rows of ventrals, not 6.

I B 1, with *L. lævis*, is opposed to I B 2 on account of a supposed difference in the relative size of the occipital and interparietal shields. The author admits that he has not had sufficient material to properly deal with *L. lævis*, but I may assure him that the occipital may, in that species, be smaller than the interparietal, supporting my statement by a figure of the shields in a female from Jerusalem; it is, however, amazing to find that it is not so in *L. græca*, as the larger size of the occipital was one of the characters appealed to by Bedriaga to justify the separation of that species from *L. danfordi*. The size of the occipital varies much in these as well as in most species of *Lacerta*, but it so happens that *L. græca* has frequently the occipital considerably larger than the interparietal, as the author himself admits further on in the description of that species ("Occipitale breiter und meist auch länger als das Interparietale"), and as shown by a figure of its condition in one of the type specimens.

Fig. 4.



Interparietal (*ip*) and occipital (*o*) shields of *L. lævis* (A) from Jerusalem, and of one of the types of *L. græca* (B).

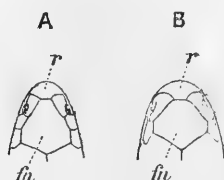
II A cannot be separated from II B, since the suture between the rostral and the frontonasal may be quite as long in *L. sardoa*, which Méhely unites with *L. reticulata* (*bedriagæ*), as in *L. horvathi*. Further on the upper caudal scales of *L. reticulata* are given as keelless, whereas the author knows perfectly well that they are often feebly keeled, and he seems to forget all about *L. sardoa*, in which they are usually very distinctly keeled (see Peracca, Boll. Mus. Tor. xx. 1905, no. 319, figure of male).

I might go on with such criticism, but enough has been said to show that the key is utterly unreliable. Of course it is only by taking such liberties with facts that the distinction of many untenable species receives an appearance of foundation in the eyes of those who are not in a position to form an independent judgment. I have always fancied keys were

intended to facilitate the identification of specimens, not merely to support an author's conception of species.

Were it not that I do not wish to lengthen this review with matters of nomenclature, I would have some complaints to make about the use of the *nomen nudum* of *L. boettgeri* to

Fig. 5.



End of snout of *L. sardoa* (A) and *L. horvathi* (B).
r, rostral; fn, frontonasal.

replace my properly described and figured *L. chlorogaster*, and about the incorrect manner in which some of my previous contributions have been referred to in the synonymy preceding the descriptions of the species and varieties. But I will reserve these points for a more detailed publication on these lizards, on which I am now engaged.

XXXV.—*Descriptions and Records of Bees*.—XXVI.

By T. D. A. COCKERELL, University of Colorado.

Melissodes atrifera, sp. n.

♂.—Length about $12\frac{1}{2}$ mm.; antennæ about 10.

Black, the *clypeus* and *labrum* with tgment wholly black; mandibles with no yellow spot; flagellum clear ferruginous beneath; third antennal joint about twice as long as second; pubescence pale ochreous, nearly white on face and lower part of cheeks, black on posterior half of mesothorax and scutellum except margin; hair on inner side of middle and hind basitarsi orange; tegulæ dark reddish, with black hair. Wings dusky, stigma and nervures fusco-ferruginous. Mesothorax shining, strongly punctured; hind margins of second and following abdominal segments broadly whitish hyaline, of first narrowly so; upper surface of abdomen with much coarse, suberect, dark fuscous hair, but with also imperfect

and inconspicuous bands of pale appressed hair; apical plate broad.

In the table in 'Entomologist,' July 1902, p. 177, this runs to *M. personatella*, from which it is readily separated by its larger size, well-punctured mesothorax, &c. It also must be compared with *M. semitrists*, Ckll., which it much resembles, but from which it is easily distinguished by the black hair on disk of abdomen above. The eyes are green; the facial quadrangle is about as broad as long; the lateral subapical spines of abdomen are small.

Hab. Mexico (*Deppe*); Berlin Museum, no. 1335. Unfortunately the exact locality is unknown to me.

Specimens of *Thygater montezuma* (Cresson) and *Melissodes grindeliæ*, Ckll., are also labelled "Mexico (*Deppe*)," but they could hardly have been collected at the same place.

Melissodes atrifera sandiarum, subsp. n.

♂.—Agreeing with the Mexican *M. atrifera*, Ckll., except as follows:—A little less robust, the head conspicuously smaller; eyes pale bluish green instead of yellowish green; tegulæ darker; vertex very shiny (dullish in *atrifera*); abdomen with very conspicuous apical or subapical hair-bands on all segments except the first, these bands yellowish white.

Known from *M. personatella*, Ckll., by the larger size, second antennal joint shorter than third; mesothorax quite closely punctured, with nearly the anterior half covered with pale hair.

Among the species of New Mexico it is easily distinguished by the combination of black tegument of clypeus and labrum, mandibles with no yellow spot, antennæ long, and thorax with much black hair above.

Hab. Sandia Mountains, New Mexico, at flowers of *Croton*, July 26, 1909 (*J. R. Watson*).

Melissodes colliciata, sp. n.

♂.—Length about 12 mm.; antennæ about 9.

Black, the clypeus, large spot on mandibles, and labrum yellow; flagellum bright ferruginous beneath; third antennal joint much longer than second; hair of head and thorax pale yellowish, on thorax above bright orange-fulvous, without any black; abdomen with hair on first segment and base of second yellowish, but the median bands on second and following segments (that on second failing in middle) glittering white; inconspicuous black or dark fuscous hair on the

otherwise bare apical part of the segments, the black zone very narrow on the first segment, broad on the three following; hind margins of segments not hyaline, except the first very narrowly; eyes dark olive; facial quadrangle approximately square, but broader above than below; mesothorax shining and strongly punctured; tegulæ ferruginous, with ferruginous hair. Wings dusky, stigma and nervures ferruginous. Hair on inner side of tarsi orange.

In the tables in Trans. Amer. Ent. Soc. 1906, this runs to group F (p. 80), and having the fifth abdominal segment with white hair from side to side, falls in the vicinity of *lanieri* and *aurigenia*, except for the larger size. It is easily separated from *lanieri* by the pale median hair-band on second abdominal segment and lack of metallic colours on abdomen. From *aurigenia* it is easily known by the larger size and dusky wings. It is very close to *M. hortivagans*, Ckll., differing in the colour of the abdominal bands and of the hair on the apical part of the abdomen. Compared with *M. xanthopteralis*, Ckll., the mesothorax is much more evidently punctured, and there are many differences in the pubescence. *M. masuca*, Ckll., is also closely allied; the band on middle of second abdominal segment is quite straight in *masuca*, which is not the case in *colliciata*.

Hab. Mexico (*Deppe*); 3 ♂ in Berlin Museum.

The name *colliciata* was proposed by someone unknown to me, and appears on the label of one of the specimens. Upon comparison with female *M. tepaneca*, Cresson, this might well be supposed to be its male; the male of *tepaneca* is known, however, and is easily separable.

Melissodes civica, sp. n.

♀.—Length 11 mm.

Robust, black; light hair very pale yellowish; black hair on clypeus, labrum, base of mandibles, extreme sides of face, top of head, mesothorax except anterior fourth, scutellum, ventral surface of thorax and bases of legs, underside of abdomen, and whole of fifth and sixth segments dorsally; the hair of the first two pairs of legs is mainly dark, though not actually black, but all the basitarsi have the hair on inner side ferruginous; the hair at apex of hind femora is dark, but the loose strongly plumose scopa of hind tibiæ and tarsi is light ferruginous; abdomen with three light (dull yellowish-grey) hair-bands, that on second segment failing in the middle; facial quadrangle much broader than long; antennæ

entirely dark; tegulæ black, with black hair. Wings dusky, nervures dark fuscous.

In the tables in Trans. Amer. Ent. Soc. 1906, this runs to group L (p. 86), and falls in the vicinity of *M. communis*, Cress., from which it may be known by the yellowish abdominal bands, the lack of any distinct light band at base of second segment, and the black hair on clypeus. In the table on p. 113 of the work cited it runs near to *M. wickhami* and *communis*. It is easily separated from *wickhami* by the abdominal segments not having hyaline margins, and the colour of hair on clypeus and anterior and middle legs. It is very much like *M. simillima*, Rob., but may be distinguished by the fourth abdominal segment having the whole margin covered with light hair, the band on third segment broad and not oblique, and the colour of hair on hind basitarsus.

Hab. Mexico; 2 ♀ in Berlin Museum.

The labels bear the following rather ambiguous information:—"Ciudad, Mexico, Californien, 8000', Ferror S." I suppose that Mexico City or the vicinity is intended. Specimens of *M. tepaneca*, Cresson, bear labels with the same data.

Xenoglossodes excurrens, Ckll., 1903.

I have a female which I took at Las Cruces, New Mexico Sept. 23, at flowers of *Isocoma wrightii*. It is in very good condition, and shows that the hind part of the mesothorax and the disk of the scutellum have some short black hair; this also can be seen in the original type on close inspection. A noticeable character is seen in the nude area on first abdominal segment, which is narrow in the middle and broadly lobate on each side, giving an outline like two caps of liberty joined front to front. In the type specimen this is not clear, some of the hair having been worn away.

Melissodes pecosella verbesinarum, Ckll., is a synonym of *X. excurrens*.

Nomia bolliana, sp. n.

♀.—Black, looking at first sight exactly like *N. triangulifera*, Vachal, and collecting orange pollen in exactly the same way, but differing as follows:—Less robust, the thorax especially smaller; anterior wing a little over 9 mm. (fully 10 in *triangulifera*); wings redder; nervures and stigma clear light ferruginous; rugose basal area of metathorax smaller, in the form of a regular very slender crescent; posterior face

of metathorax much smaller, little flattened, and without any evident rim, strongly but quite sparsely punctate, and with a very deep and large pit; abdomen more shining and more coarsely punctured, the first segment with large moderately close punctures of uniform size (minute dense punctures and scattered larger ones in *triangulifera*); hind margins of segments ferruginous hyaline; tarsi and apical part of tibiæ ferruginous.

Hab. Dallas, Texas (*Boll*): Berlin Museum, no. 21286.

Halictus supercretus, sp. n.

♀.—Length 10 mm. or slightly over.

Black, little shining, densely and very minutely punctured, with broad even bands of very pale yellowish tomentum on bases of abdominal segments 2 to 4; hind spur so minutely serrate as to seem simple; face elongate, clypeus projecting, long dark fuscous hairs projecting from its lower margin; antennæ dark, flagellum faintly reddish beneath; tegulæ piceous; nervures fuscous, stigma dull ferruginous. Wings dusky; area of metathorax hardly defined, dull, with hardly noticeable short subbasal striæ; truncation of metathorax dull, not strongly bounded.

In Crawford's table in Journ. N. Y. Ent. Soc., Dec. 1907, it runs to *H. bardus*, from which it is distinguished by any characters. Among Vachal's Mexican species it comes in the group of *H. crocoturus* &c., but it does not agree with any of his descriptions. It is also distinct from Smith's Mexican species, the types of which I have seen. In its close fine sculpture it is like *H. manitonellus*, Ckll., but the face is much longer than in that species and the first two abdominal bands are not reduced in the middle. The longer and much less shining face, longer eyes, &c. readily separate it from *H. trizonatus*. The cheeks and occiput are conspicuously clothed with white hair; there is no bright coloured hair on the thorax.

Hab. Mexico (*Deppe*): Berlin Museum, no. 2583.

A species closely allied to the more northern *H. trizonatus*, *coriaceus*, &c.

Andrena colletina, Ckll.

This species has hitherto been known from a single male. Two males and a female are in the Berlin Museum, collected in Colorado many years ago by Morrison. The female closely resembles the male, but has a broader (width about $4\frac{1}{2}$ mm.) abdomen. The intervals between the broad hair-bands on

the abdomen are clothed with black hair as in the male. The hind basitarsus is broad and flat, with the hair on its inner side reddish chocolate, while that on the inner side of the tibia is pale yellow like the rest of the pubescence. The facial foveæ are extremely broad but short, pale ochreous, and very conspicuous. Process of labrum deeply emarginate; flagellum ferruginous beneath except at base; caudal fimbria black.

This is, of course, much like *A. hirticincta*, Prov., but the facial foveæ are broader, the wings are much clearer, and the light hair of hind tibiæ and black hair on abdomen between the bands are quite distinctive. The proportions of the antennal joints do not differ.

Andrena deppeana, sp. n.

♀.—Length 10 mm.

Head and thorax black, abdomen blue-green; head ordinary, facial quadrangle about square; clypeus shining, with strong sparse punctures, its margin dull, with close punctures; labrum shining, without a distinct process; front dull; ocelli prominent; facial foveæ black or fuscous, about half width from eye to antenna, oblique, ending above close to (even going a little behind level of) lateral ocelli, and below a little above level of antennæ, very close to eye; flagellum obscure brownish beneath; third antennal joint longer than the two following united; mesothorax dull, with microscopically tessellate surface and scattered hardly noticeable punctures, but at sides, near to tegulæ, more shining and more evidently punctured; disk of scutellum smooth and shining; area of metathorax dullish, granular, poorly defined; hair of head and thorax pale yellowish, black on posterior part of pleura, dull whitish on sides of face, pale fuscous at sides of clypeus, partly short and black on disk of scutellum and posterior part of mesothorax; legs reddish black, with greyish-fuscous hair, middle femora with a fringe of yellowish-white hair beneath; tegulæ shining piceous. Wings strongly dusky, with a reddish tint, region of marginal cell darker; stigma and nervures dark ferruginous; first r. n. joining second s.m. near middle; abdomen with a sericeous surface, hardly punctured, second segment in middle depressed less than a third; third and fourth segments with narrow but dense pale ochreous apical hair-bands, and a little of the same at sides of second; caudal fimbria pale ochreous. General aspect like *A. candida*, Smith, but larger, with shorter and less abundant

hair on head and thorax, much darker wings, differently coloured abdominal bands, &c. The abdomen is flattish.

Hab. Mexico (*Deppe*). Two females: Berlin Museum, 2584, 2585.

Andrena dallasiana, sp. n.

♂.—Length slightly over 7 mm.

Black, without light markings on face; all the tarsi light ferruginous; hind tibiæ light ferruginous, with a median dark cloud; pubescence dull pale ochreous; abdomen shining, very minutely and inconspicuously punctured, without any definite hair-bands except, rather indistinctly, at sides of segments; head broader than long; mandibles ferruginous at apex; clypeus densely covered with hair; cheeks ordinary; vertex dull; antennæ thick, moniliform, third joint conspicuously shorter than fourth, flagellum obscure reddish beneath; mesothorax dull and granular, with sparse small punctures; area of metathorax with delicate but evident ridges; tegulæ fulvous. Wings reddish hyaline, nervures and stigma clear ferruginous; stigma large; third s.m. more than twice as broad as second; second abdominal segment depressed a little less than one-third.

This is extremely close to an insect from Fort Collins, Colorado, determined by Mr. Viereck as *A. texana*, Cresson, but not agreeing well with Cresson's description (Viereck must have had access to Cresson's type, however). It differs by the proportionately shorter third antennal joint, lighter tegulæ, redder wings, more delicate sculpture of metathorax, and somewhat narrower face. In Viereck's table in *Entom. News*, July 1907, it runs to *A. dackei*, but differs by having the second dorsal segment depressed less than one-third; in Robertson's table of Illinois species it runs in *Trachandrena* to *claytoniæ*, which it very greatly resembles, differing, however, in the much less coarsely sculptured area of metathorax. If run in *Andrena* s. str. it goes to *nasonii*, but differs in the antennal joints.

Hab. Dallas, Texas (*Boll*): Berlin Museum, 21288.

Andrena tacitula, sp. n.

♂.—Length 8 mm.

Black, comparatively robust, looking like a female; pubescence long, dull whitish, with a yellowish tint on head and thorax above; head broad, facial quadrangle much broader than long; eyes dark plum-colour; process of labrum truncate, slightly inclined to be emarginate; clypeus shining,

strongly and very closely punctured, with a very delicate median line; antennæ long and thick, third joint about as long as fourth, flagellum very faintly reddish; vertex rugosely punctured, with a small shining space next to each lateral ocellus; cheeks rounded, ordinary; mesothorax and scutellum shining, with very strong punctures; area of metathorax well defined, strongly but not very coarsely ridged; tegulæ piceous, ferruginous in middle. Wings reddish hyaline, nervures and stigma dark ferruginous; second s.m. rather large, receiving r. n. beyond middle. Legs wholly dark, with light hair, that on inner side of tarsi ferruginous. Abdomen strongly punctured, the apical depressions bounded by distinct ridges; second segment in middle depressed nearly one-half; second and following segments with white hair-bands, more or less failing in middle on second and third.

In Viereck's table (1907) this runs to *A. weedi*, from which it is at once distinguished by the sculpture of abdomen &c. In Robertson's table it runs nearest to *A. mariae*, but differs at once by the triangular area of metathorax, not distinctly bounded (apex cut off) behind. In my table in Univ. of Colo. Studies, 1907, it runs near *A. crategi*, but that species is entirely different in the appearance of the abdomen &c. Superficially it is not unlike *A. lappulæ*.

Hab. Colorado (*Morrison*): Berlin Museum.

Andrena subtrita, sp. n.

♀.—Length 9 mm.

Faintly metallic, the scutellum with a greenish tint, the metathorax blue-black, the abdomen dark bluish, with conspicuous broad white hair-bands on the second and following segments, that on second more or less broadly interrupted in middle; hair of head, thorax, and legs dull whitish; head broad, facial quadrangle much broader than long; clypeus quite black, but front bluish; process of labrum very broad, not emarginate; clypeus with a subsericeous lustre and feeble punctures; third antennal joint a little longer than the next two together; flagellum dark ferruginous beneath; facial foveæ whitish, not separated from orbit, going hardly at all below level of antennæ, and about half width between antennæ and eyes; mesothorax and scutellum dull, not evidently punctured; area of metathorax dull and granular, not defined; tegulæ shining rufo-testaceous. Wings hyaline, faintly reddish, stigma and nervures light ferruginous; second s.m. narrow, receiving the r. n. a little beyond the middle. Legs

somewhat reddish, small joints of tarsi ferruginous ; hair on inner side of hind basitarsi pale.

Close to *A. candida*, Smith, but differs in colour of facial foveæ, stronger abdominal bands, light hair at apex of abdomen, &c. Compared with *A. illinoensis*, Rob., the face is much broader and the abdominal bands are heavier, though the colour of the apical hair is the same. It is also related to *A. salicinella*, Ckll.

Hab. Nevada (*Morrison*) : 3 ♀ in Berlin Museum.

Andrena hirticincta surda, subsp. n.

♂.—Length about 10 mm.

With bright yellow pubescence ; in all respects like *A. hirticincta*, Prov., except that the broad and hairy cheeks are rounded, not angled, the tarsi are ferruginous, the hind pair light yellowish ferruginous, the stigma is rather lighter, and the wings have a fuscous apical cloud. The second s.m. is scarcely narrowed above. In some of the published tables this seems to run to *A. auricoma*, but that species has the hair quite differently coloured, ferruginous rather than yellow. The absence of black hair on the abdomen readily separates it from *A. colletina*.

Hab. Colorado (*Morrison*) : Berlin Museum.

A male of genuine *A. hirticincta* was also collected in Colorado by Morrison.

XXXVI.—On new Species of West-African Culicidæ.

By Dr. W. M. GRAHAM.

Culex albovirgatus, sp. n.

♀.—*Head* dark brown, covered with cream-coloured narrow curved scales and numerous dark brown upright forked ones with pale forks. A line of white narrow curved scales round the eyes, which run into lateral white patches of flat scales. Numerous pale brown bristles converge forward over occiput and project between the eyes. *Clypeus* dark brown, nude. *Palpi* dark brown, with scattered white scales, especially upon the inner surface. *Proboscis* : base dark brown, becoming gradually lighter, so as to form a badly defined broad pale band occupying nearly the median half of proboscis, followed by a dark brown portion about one-fourth the length, with a pale conical apex. *Antennæ* pale, with

at the whorls. *Thorax* dark brown, covered with brown scales showing two longitudinal dark bare median area in front of scutellum covered with coloured scales, and a small area of pale scales in front of the insertion of the wings. Numerous reddish-brown bristles. *Scutellum* covered with cream-coloured scales and having ten dark brown bristles on the median lobe. *Metanotum* dark brown. *Pleura* brown, with patches of white scales. *Abdomen* covered with dark purple-brown scales; first segment bare except in middle, where are two small median patches of brown scales; second segment with a triangular median white patch; the other segments with very narrow white basal bands. Elongated basal lateral spots increasing in size towards apex. Border-hairs pale. *Venter* pale-scaled. *Legs* dark brown, with a band of cream-coloured scales extending along the internal surface of the femora and tibiæ to the apex of the first tarsal. All joints banded except the last tarsal joint, the banding involving both sides of the joints. *Ungues* equal and simple. *Wings* covered with dark brown scales, particularly dark on third vein. First submarginal cell longer and narrower than second posterior. Stem of first submarginal cell $\frac{1}{3}$ length of cell; stem of second posterior more than $\frac{1}{2}$ length of cell. Posterior cross-vein double its own length from mid cross-vein. *Halteres* with pale knobs and stems.

Length 4·5 mm.

♂.—Very similar to female, but the band on the proboscis is much narrower and better defined. *Palpi* dark brown, with dark brown hairs and five white bands; first band narrow, second broad, third and fourth narrow, fifth apical: longer than proboscis by nearly the length of the two terminal segments. *Abdomen*: the lateral spots are more distinct and form narrow bands prolonged down the side of the segments. *Ungues*: first and second pair unequal and uniserrate; third pair equal and simple. *Wings*: stem of first submarginal $\frac{1}{2}$ length of cell; stem of second posterior equal to length of cell; posterior cross-vein double its own length behind mid cross-vein.

Length 4·5 mm.

Culex pullatus, sp. n.

♀.—*Head* dark brown, covered with white narrow curved scales, which also form a border round the eyes, and with dark brown upright forked scales, distributed in four clumps, separated by pale upright forked scales. *Palpi* dark brown.

Clypeus dark brown, nude. *Proboscis* purplish. *Antennæ*: basal segment ochreous; remaining segments with white bands at whorls; plume-hairs dark. *Thorax* brown, covered with buff scales, showing longitudinal dark bare lines. Light-coloured scales upon the anterior edge of mesonotum, and some pale scales in front of the scutellum and in front of the insertion of the wings. Numerous dark brown bristles in front of scutellum and round the insertion of the wings. *Scutellum* pale brown, with cream-coloured scales and nine dark brown bristles on the mid lobe. *Metanotum* pale brown. *Abdomen* covered with purple-brown scales; the terminal segment with a narrow white basal band; all segments with basal lateral spots; border-hairs pale. *Legs* dark purple-brown (iridescent); the femora pale beneath; the tibiæ with pale apical spots. *Ungues* simple and equal. *Wings* covered with pale brown scales. First submarginal cell longer and narrower than second posterior. Stem of first submarginal $\frac{1}{4}$ length of cell; stem of second posterior $\frac{1}{3}$ length of cell. Posterior cross-vein more than its length behind mid cross-vein. *Halteres* with pale stem and knob.

Length 5 mm.

♂ very similar to female. *Palpi* acuminate, dark brown, unbanded, with dark brown bristles. *Wings*: stem of first submarginal cell $\frac{1}{2}$ length of cell; stem of second posterior cell more than $\frac{1}{2}$ length of cell; posterior cross-vein double its own length behind the mid cross-vein.

Length 5 mm.

Culex aquilus, sp. n.

♂.—*Head* black, covered with fine white narrow curved scales and black upright forked ones, with some pale forked scales in front. Lateral patches of small white flat scales. White borders to orbits, with golden bristles converging forward. *Palpi* pale brown, unbanded, acuminate, longer than proboscis by more than the length of the terminal segment. Terminal segments nearly equal in length, with dark brown hairs. *Proboscis* brown, unbanded. *Clypeus* dark brown. *Antennæ*: basal segment brown; plume-hairs brown. *Thorax* pale brown, covered with fine ochreous narrow curved scales, showing two longitudinal bare lines. Three rows of fine brown bristles on anterior half and four rows of coarse dark brown bristles on posterior half. *Scutellum* covered with fine white scales, with 5 or 6 brown bristles on the mid lobe, 3 bristles on the lateral lobes. *Meta-*

notum pale brown. *Pleura* brown, with white scales. *Abdomen* covered with dark brown scales, with basal lateral white spots; last segment with a narrow basal white band uniting the spots. *Venter* pale brown, becoming darker towards apex, with white basal median spots on last four segments. *Legs* dark brown, unbanded, bristly; hind femora and tibiæ with pale apical spot; border-bristles pale brown. *Ungues* on fore and mid legs unequal and uniserrate; on hind legs equal and simple. *Wings* with pale brown scales. First submarginal cell longer and narrower than second posterior; stem $\frac{1}{2}$ length of cell; stem of second posterior equal to length of cell; posterior cross-vein double its own length behind the mid cross-vein. *Halteres* pale brown.

Length 3 mm.

Megaculex pincerna, sp. n.

♀.—*Head*: the middle of the occiput is covered with broad white upright forked scales, with white narrow curved scales between them. On either side are lateral areas of long cream-coloured flat scales, enclosing small areas of purplish-brown flat scales. There is a row of small black upright forked scales near the nape. Five pale bristles surround each orbit, and similar bristles project between the eyes. *Palpi* brown, with cream-coloured scales at apex. *Proboscis* brown, paler and somewhat expanded towards tip. *Clypeus* dark brown, nude. *Antennæ*: basal segment pale brown, with a few hair-like scales upon inner half; second segment with some dark brown elongated scales; plume-hairs brown, paler at tips. *Eyes* blue-black. *Thorax* dark brown, covered with pale golden scales, showing two longitudinal bare lines, which divide up the middle of the mesonotum into three golden bands; on either side of the external bands is a dark brown scaled lateral area, and further back in front of each wing-insertion is a small lateral white spot. In the posterior half of the mesonotum the middle is occupied by a dark-scaled wineglass-like figure, the stem standing upon the scutellum; on each side is a dark elongate area, extending forward beyond the wings. There are pale brown divergent bristles on the anterior edge of thorax, and bunches of darker convergent bristles arising behind the wing-insertion and projecting backward. *Scutellum* covered with nearly white narrow curved scales; six pale brown bristles to mid, three bristles to each lateral lobe. *Prothoracic lobes* pale, with golden bristles. *Pleura* brown, with patches of white scales. *Abdomen* covered with purplish-brown scales with white basal

bands and basal lateral spots; border-bristles pale golden. *Venter* pale-scaled, with narrow dark apical bands. *Legs* dark purple-brown, with yellowish-white banding which involves both sides of the joints with the exception of the knee-joints, where the band is apical only. The last two segments of the tarsi are pale brown on the fore and mid pair of legs and yellowish white upon the hind legs, in the latter involving about $\frac{1}{4}$ of the third segment also. *Ungues* all equal and simple. *Wings* covered with pale brown pear-shaped scales; costa dark and somewhat bristly; forked cells small; the first submarginal longer and narrower than second posterior; stem somewhat longer than the cell; stem of second posterior cell $\frac{1}{3}$ longer than cell. Posterior cross-vein slightly more than its own length behind the mid cross-vein. *Halteres*: stem pale, knobs purple-brown.

Length 3 mm.

♂.—Resembles female. *Palpi* slightly longer than proboscis; apical segment swollen or "clubbed," with bright golden bristles; somewhat behind the middle of the palpi there is a pale band which extends beneath almost to the base. *Proboscis*: there is an indistinct narrow band about $\frac{1}{3}$ of the length from the apex. *Antennæ*: plume-hairs pale brown. *Wings* as in female, but the ratio of stem to cell of first submarginal cell somewhat greater. *Ungues* on fore and mid legs unequal, uniserrate; on hind legs equal, simple.

Length 3 mm.

Culex caliginosus, sp. n.

♀.—*Head* black, with a triangular area of purple-brown scales in front and white narrow curved scales behind; black upright forked scales all over, brown bristles round the orbits, and pale bristles projecting forward between the eyes. *Palpi* dark brown, with fine white hairs at apex. *Proboscis* very dark brown, unbanded. *Clypeus* very dark brown. *Antennæ* black, with narrow white bands at the whorls; basal segment dark brown, with a few hair-like scales upon the inner half; plume-hairs very dark. *Thorax* dark brown, covered with golden-brown scales, paler laterally; an area of whitish scales in front of the scutellum and above the insertion of the wings. Four rows of dark brown bristles, becoming coarser and denser behind. *Scutellum*: mid lobe with a small median area of purple-brown scales behind, surrounded by white scales. Lateral lobes with white scales; eight dark bristles to mid lobe, seven to lateral lobes. *Metanotum* very dark brown. *Pleura* dark brown, with white-scaled patches.

Abdomen covered with dark purple-brown scales; second segment with median basal white patch; the other segments with white basal bands, except the terminal segment; border-hairs pale. *Venter* black, with basal median patches of white scales. *Legs* dark purple-brown; femora pale beneath; apical pale spots upon femora and tibiæ. *Ungues* equal and uniserrate. *Wings* with dark brown dense scales; first submarginal longer and narrower than second posterior cell; stem more than $\frac{1}{2}$ the length of the cell; stem of second posterior equal to the length of the cell; posterior cross-vein more than its own length from the mid cross-vein. *Halteres* pale, with pale knobs.

Length 4 mm.

♂.—Resembles the female. *Palpi* longer than proboscis by length of terminal segment; terminal segments of nearly equal length, the apical one being paler and thinner, with somewhat rounded point; plume-hairs brown. *Scutellum*: mid lobe with six bristles, lateral with five. *Ungues* on fore and mid legs unequal and uniserrate; on hind legs equal and simple. *Wings*: first submarginal stem somewhat shorter than cell; second posterior stem somewhat longer than cell; posterior cross-vein somewhat more than its own length from the mid cross-vein.

Length 4 mm.

Culex lividocostalis, sp. n.

♀.—*Head* dark brown, covered with white narrow curved, and dark brown upright forked scales, with white lines round the orbits running into lateral patches of flat white scales; orbital bristles dark brown. *Palpi* dark brown, with scattered white scales on inner surface. *Clypeus* dark brown. *Proboscis* dark brown, with pale apex, unbanded. *Antennæ* brown, with narrow white bands at whorls; plume-hairs dark brown. *Thorax* brown, covered with golden-brown scales, showing two longitudinal bare lines; scales in front of scutellum somewhat lighter in colour; bristles dark brown behind, paler in front. *Scutellum* yellowish green, with pale brown scales; eight dark brown bristles to mid, four to each lateral lobe. *Pleura* brown, with white-scaled patches. *Metanotum* dark brown. *Abdomen* covered with dark brown scales; first segment with a median brown patch, the other segments with basal white bands, becoming narrow in the middle line and expanding laterally as they approach the apex; on the last segment the lateral spots do not meet to form a band; basal lateral white spots on all segments;

border-hairs pale. *Venter* dark brown, with basal white bands. *Legs* dark purple-brown; femora pale beneath; femora and tibiae with small pale apical spots; tibiae with indistinct lines of pale scales on inner surface. *Ungues* equal and simple. *Wings* with brown scales, blue-black on costa; first submarginal cell longer and narrower than second posterior; stem more than $\frac{1}{3}$ length of cell; stem of second posterior $\frac{2}{3}$ the length of the cell; posterior cross-vein oblique and double its own length from the mid cross-vein. *Halteres* pale, stem with brown knob.

Length 3.5 mm.

♂.—Resembles the female. *Palpi* dark brown; apical segments blue-black, with dark brown hairs; longer than proboscis by length of terminal segment. *Scutellum* with seven or eight bristles on the mid lobe. *Abdomen* very hairy. *Ungues* on fore and mid legs large, unequal, and uniserrate; on hind legs small, equal, and simple. *Wings*: stem of first submarginal somewhat more than $\frac{1}{2}$ length of cell; stem of second posterior equal to length of cell; posterior cross-vein double its own length from the mid cross-vein.

Length 3.5 mm.

Myxosquamus paludosus, sp. n.

♀.—*Head* black, covered with blue-black scales with purple iridescence; some black upright forked scales behind; orbital bristles dark brown. *Palpi* dark purple-brown (almost black). *Clypeus* dark brown. *Proboscis* black, with blue iridescence, unbanded. *Antennae*: basal segment black, with a few narrow scales on inner half; second segment yellow at insertion into basal segment; plume-hairs dark brown. *Thorax* black, covered with brown, and coarse blue-black narrow curved scales, showing two longitudinal bare lines; on each side, external to these lines a row of black bristles running the whole length of mesonotum and all directed backwards; thick-set patches of similar bristles above and behind the wing-insertion. *Scutellum*: mid lobe with a median area of blue-black small flat scales surrounded behind and at the sides by purple-brown, coarse, narrow, curved scales; lateral lobes with purple-brown narrow curved scales; six dark brown bristles to mid, seven to each lateral lobe. *Pleura* dark brown, with white-scaled patches. *Metanotum* dark brown. *Abdomen* covered with dark brown scales, unbanded and tapering to the apex; with basal lateral white spots, except upon the terminal segment; border-hairs dark brown. *Venter* black, with basal white bands except on the

terminal segment. *Legs* blue-black, unbanded, bristly; femora pale beneath; tibiæ with small golden spots on inner surface. *Ungues* on fore and mid legs equal and uniserrate, on hind legs equal and simple. *Wings* covered with purple-brown scales, with blue iridescence on the costa; first submarginal cell longer and narrower than second posterior; stem slightly more than $\frac{1}{2}$ length of cell; stem of second posterior equal to length of cell; posterior cross-vein double its own length from the mid cross-vein. *Halteres*: stem pale, knob dark.

Length 4.5 mm.

♂.—Resembles the female. *Palpi* blue-black, same length as proboscis. *Thorax* with somewhat darker scales. *Antennæ*: plumehairs dense, very dark brown. *Ungues* on fore and mid legs unequal and uniserrate, on hind legs equal and simple. *Wings*: stem of first submarginal $\frac{2}{3}$ length of cell; stem of second posterior equal to length of cell; posterior cross-vein double its own length from the mid cross-vein.

Length 4.5 mm.

Stegomyia pollinator, sp. n.

♀.—*Occiput*: median area covered with black scales, with a blue iridescence, the lateral areas with silvery-white scales; a deep border of silvery-white scales surrounds the eyes and six dark hairs project forward. *Palpi* long, covered with black scales with a violet iridescence. *Clypeus* black, nude. *Proboscis* black. *Antennæ* black, with narrow white bands at whorls; second joint densely scaled with broad black scales. *Eyes* shining blue-black. *Thorax* black, covered with coarse dusky black scales, with a greenish-blue iridescence. On each side of the thorax immediately in front of the wing there is a nearly circular silvery-white patch, and further forward a larger semicircular silvery-white patch above each prothoracic lobe. A median band, with a contour of overlapping circles, and formed of a double row of large oval silvery-white flat scales, with a very narrow black line of separation between them, runs from the anterior edge to the bare space before the scutellum, where the band separates to enclose the bare space, and then extends on to the scutellum in two distinct white bands. *Scutellum*: middle lobe black, with white lateral bands; lateral lobes with black scales; mid lobe with two dark bristles; lateral lobes with three dark bristles. *Prothoracic lobes* covered with silvery-white scales. *Pleura* black, with silvery-white patches of

scales. *Abdomen* covered with black scales, showing a violet iridescence; sixth and seventh segments with silvery-white apical spots; eighth segment with a basal silvery-white patch; all segments have lateral, nearly circular, basal silvery-white spots; border-bristles black. *Venter* black, with broad basal silvery-white bands. *Legs*. Front pair: femora and tibiae bristly, black, with a few basal pale scales on first tarsal segment and a line of silvery scales upon the under surface of the femora. Mid pair: femora and tibiae bristly, black; femora with a median silvery-white patch on the anterior surface; first tarsal with basal white band; second tarsal with basal two-thirds white, the remainder black; the other segments black. Hind pair: femora and tibiae bristly, black; femora with median silvery-white patch; tibiae with narrow basal white band, much broader beneath; first tarsal with very small basal white spot; second tarsal mostly white, the other segments black. *Ungues* equal and uniserrate. *Wings* covered with brown scales, the wing-membrane with a brown stain between costa and second longitudinal vein; first submarginal cell longer and narrower than second posterior cell, its stem $\frac{1}{2}$ the length of the cell; stem of second posterior considerably more than $\frac{1}{2}$ length of cell; posterior cross-vein distant its own length from the mid cross-vein. *Halteres*: stem ochreous; knob dark, with silvery-white apex.

Length 5.5 mm.

♂.—Resembles the female. *Palpi* slightly shorter than proboscis, black-scaled. *Legs*: the white spots on front pair rather more distinct than in the female. *Wings*: first submarginal longer and narrower than second posterior; stem of first submarginal considerably more than $\frac{1}{2}$ length of cell; stem of second posterior as long as cell; posterior cross-vein distant more than its own length from mid cross-vein. *Ungues* on fore and mid legs unequal and uniserrate, on hind legs equal and uniserrate.

Length 4 mm.

The following African species of *Stegomyia* are characterized by having large oval silvery-white flat scales, with the peculiar contour of overlapping circles upon the thorax and a few narrow curved scales upon the nape:—

1. *St. africana*, Theobald.
2. *St. apicoargentea*, Theobald.
3. *St. luteocephala*, Newstead.
4. *St. pollinator*, Graham.

They thus differ markedly in scale-structure from the type species (*St. fasciata*, F.), and should, I believe, be erected into a new genus if scale-structure be regarded as of generic value.

XXXVII. — *Two new Duikers related to Cephalophus abyssinicus and a new Dendromus from Mt. Elgon.* By R. C. WROUGHTON.

THE Natural History Museum has recently received two specimens of a Duiker from the Gwas Nyisha Plateau, B. E. A. These specimens, a male and a female, collected and presented by Mr. F. C. Selous and Major Horsburgh respectively, prove, on comparison with the material already in the National Collection, to be indistinguishable from *C. abyssinicus nyansæ* of Neumann. The reduction in girth of the horn at the base and its compression antero-externally into a ridge is fairly constant amongst these Duikers, but Mr. Selous's buck shows these characters to an exaggerated extent. On laying out the specimens for this comparison, however, it became evident that the Duiker of the Kenya District is a well-marked geographical race.

Cephalophus abyssinicus hindei, subsp. n.

A Duiker of the northern short-eared section of the *grimmii* group, distinguished by its brighter colouring.

Size about the same as *nyansæ*. General colour above tawny ochraceous, bright on the neck and shoulders, duller on the back and loins, but the yellow tinge is never absent, even on the rump, as it is in *nyansæ*; individual hairs of the neck drab-grey, with ochraceous tips; more posteriorly the ochraceous tip becomes a subapical ring, and the tip is black. Below, the chin and the insides of the upper part of the limbs whitish; throat ochraceous buff, the hairs the same colour in their whole length; the abdomen towards the flanks coloured like the neck, fading to buffy white in the centre, the hairs with pale drab bases.

Skull of the same size as in the more western race.

Dimensions of the type (approximate, from a skin specimen):—

Head and body 825 mm.; tail 100; hind foot 225; ear 95.

Skull: greatest length 160; greatest breadth 72; nasals 61; muzzle in front of p^2 46; palate 76; upper tooth-row 52; length of upper molars 28.5; bullæ 21.5.

Hab. Kenya District, B. E. A. (Type from Fort Hall.)

Type. Young male. B.M. no. 4. 12. 6. 11. Collected and presented to the Natural History Museum by Mr. S. L. Hinde.

The type is a young male in milk-dentition with a fine coat.

The following are similar skull-measurements of an old male (skin mutilated) collected by Mr. Hinde at Nyeri, Kenya District, as compared with those (in brackets) of Mr. Selous's specimen of *nyansæ*, which is about the same age:—

Greatest length 159 (161) mm.; greatest breadth 76 (72); nasals 51.5 (51); muzzle in front of p^2 50 (48); palate 74 (76); upper tooth-row 44 (49); length of upper molars 26 (28); bullæ 24 (24).

Typical long-eared (110–125 mm.) *C. grimmii* occupies the whole of S. Africa, where it has received many names. At its northernmost limit, on the west, is *C. splendidulus*, Gray, from Angola; further east, the Matabili form is *fulvescens*, Lorenz, which probably crosses the Zambesi into Northern Rhodesia; the eastern representative is *altifrons*, Peters (= *ocularis*, Pet.), from Southern Mozambique, which, as shown by specimens in this Museum, ranges south of the Zambezi to Tette and north of it to the Loangwa River, as far north at least as S. Angoniland. A series, however, in the National Collection from the Shire Highlands belongs to the northern, short-eared, *abyssinicus* section; it is so markedly different from any of the forms mentioned above, that it seems worthy to be ranked as a distinct geographical race. I propose to call it

Cephalophus abyssinicus shirensis, subsp. n.

A Duiker of the short-eared section of the *grimmii* group, distinguishable by its pale, bright ochraceous colouring.

Size about the same as in the East African races. General colour above ochraceous buff; all hairs with drab bases, those of the neck and shoulders ochraceous buff to their tips, those of the back shortly tipped with black. Colouring below as in *hindei*, but in a much paler shade.

Skull as in *hindei*.

Dimensions of the type (approximate, from a dry specimen):—

Head and body 950 mm.; tail 100; hind foot 250; ear 90.

Skull: greatest length 164; greatest breadth 76; nasals 55;

muzzle in front of p^2 50; palate 81; upper tooth-row 47; length of upper molars 28; bullæ 17·5.

Hab. Zomba, Nyasa.

Type. Old male. B.M. no. 94. 6. 7. 7. Collected by A. Whyte, and presented to the Natural History Museum by Sir H. H. Johnston.

The grizzling so characteristic of the colouring of the more northern forms is in *shirensis* so fine and faint that, at quite a short distance, the coat seems to be unicolorous; this and the pale, bright ochraceous colouring serves to distinguish it at once from the other races.

In the latest collection of mammals made by Mr. R. Kemp in the Elgon District of British East Africa was a number of specimens of a *Dendromus*. The bulk of these specimens were *D. acraeus*, a species described by me in the December issue of these 'Annals'; but amongst them was a specimen so entirely different from them and from any other species known that it seems to me to deserve a name.

Dendromus ruddi, sp. n.

A *Dendromus* about the size of *D. nyikæ*, closely resembling *D. messorius*, Thos., from the Cameroons, in colouring, but with larger ears and a longer hind foot and tail.

Fur of back 7–8 mm. long, basal two-thirds dark slate-colour, distal portion "tawny ochraceous." General colour above between "mars-brown" and cinnamon. Hands and feet pale; tail dark above, rather paler below.

Skull small; smaller, narrower, and more delicately made than in *messorius*.

Dimensions of type (measured by the Collector):—

Head and body 69 mm.; tail 91; hind foot 18·5; ear 11·5.

Skull: greatest length 21; basilar length 15·5; greatest breadth 11; nasals 7·6; interorbital breadth 3·5; brain-case breadth 9·5; diastema 5·3; upper molar series 3·5.

Hab. Malikisi, Mt. Elgon, B. E. A. Alt. 5000'.

Type. Old male. Rudd Collection. Original number 476. Collected by R. Kemp, 28th November, 1909.

D. ruddi closely resembles *messorius* in its colouring, while its size and proportions are like those of *nyikæ*. There is no other species with which it might be confused, nor any other, of its size, in which the median black line is entirely absent.

XXXVIII.—*Eight new African Rodents.*

By WILFRED H. OSGOOD.

IN the study of a collection of African Mammals for the Field Museum of Natural History, several undescribed forms have been encountered in the British Museum collection, access to which has been most courteously afforded me. At the invitation of Mr. Oldfield Thomas, the following descriptions of these new forms have been drawn up. To Mr. Thomas I am pleased to make unlimited acknowledgments for advice and criticism as well as for the use of the collection which has grown under his charge to its present unrivalled proportions.

Tachyoryctes splendens somalicus, subsp. n.

Type from Ujawa, about 100 miles south-west of Berbera, Somaliland. No. 98.6.9.11, British Museum. Adult female. Collected December 14th, 1897, by R. M. Hawker.

Characters.—Similar to *Tachyoryctes splendens*, but smaller and paler; decidedly smallest of the *splendens* group. General colour of upperparts pale cinnamon; top and anterior part of head dark brown; hairs of underparts slate-grey at bases, light wood-brown at tips. Skull small; nasals short and narrow; audital bullæ and molars small; incisors very narrow.

Measurements.—Type: total length 246 mm.; head and body 190; tail-vertebræ 56; hind foot 24. Skull of type: length from lambdon to tip of nasals 34.7; basilar length 35.5; mastoid breadth 20.9; interorbital constriction 6.8; length of nasals 14.5; postpalatal length 14.1; diastema 15.7; maxillary tooth-row (crowns) 7.5; width of incisor 2.2.

Remarks.—A cotype of the Abyssinian *Tachyoryctes splendens* shows that this species is typically dark-coloured and that its skull is decidedly larger with much heavier teeth than the form here described from Somaliland. Other specimens from Abyssinia are somewhat paler than the type of *splendens*, but show essentially the same cranial characters.

Pelomys fallax insignatus, subsp. n.

Type from Fort Hill, Northern Nyasa. No. 97. 10. 1. 220, British Museum. Adult male. Collected July 1896 by A. Whyte. Original No. 185.

Characters.—Similar to *Pelomys fallax*, but lacking a well-defined blackish median dorsal stripe, the upperparts

being uniformly and coarsely mixed dusky and tawny. Skull with shorter and broader nasals than in *fallax*; otherwise similar. Somewhat similar to *Pelomys frater*, but molar teeth actually and relatively smaller.

Measurements.—Type (measured dry): tail-vertebræ 138; hind foot (s. u.) 30, (c. u.) 33. Skull of type: length from front of interparietal to tip of nasals 32·5; mastoid breadth 13·5; interorbital constriction 5·2; length of nasals 14·8; greatest width of nasals 5·2; diastema 9·3; palatine slits 6·8; maxillary tooth-row 6·3.

Remarks.—The dark dorsal stripe mentioned by Peters in the original description of *fallax* is found well-developed in specimens from Beira and Tambarara, Portuguese East Africa, which therefore undoubtedly are typical; but in specimens from more northerly localities it is increasingly indistinct and becomes entirely absent in those from Northern Nyasa. These Nyasa specimens, of which many are available, are characterised also by broad short nasals.

Mus damarensis rhodesiæ, subsp. n.

Type from Petauke, East Loangwa District, Northern Rhodesia. Altitude 2400 ft. No. 7. 1. 11. 57, British Museum. Adult female. Collected January 27th, 1905, by S. A. Neave.

Characters.—Similar to *Mus damarensis*, but colour darker; upperparts tawny ochraceous mixed with dusky; sides but little paler than back; tail uniform blackish above and below. Skull similar to that of *damarensis*, but audital bullæ smaller and nasals slightly broader posteriorly; somewhat similar to that of *Mus pædulcus*, but molars larger.

Measurements.—Type: total length 274 mm.; head and body 119; tail-vertebræ 155; hind foot (s. u.) 24; ear 20·5. Skull of type: greatest length 30·7; basilar length 24·9; zygomatic breadth 15·4; nasals 11·4; least interorbital width 4·7; postpalatal length 11·2; diastema 8·3; palatine slits 6·8; maxillary tooth-row 5·2.

Remarks.—In external appearance this mouse shows much resemblance to certain species referred to the genus *Thamnomys*. It is, in fact, one of a group of several species which appear to be somewhat connectant between *Thamnomys* and *Mus*. The group includes *Mus pædulcus*, *Mus damarensis*, *Mus nigricauda*, and *Thamnomys loringi* (= *Mus loringi*). With the exception of *M. loringi*, which obviously is closely allied to *M. nigricauda*, all the species of this small group have the hairs of the underparts pure white to the roots, the

tail long, hairy, and usually unicolour, and the ears clothed with ochraceous hairs, in these respects agreeing with *Thamnomys*. Moreover, their skulls, except for rather enlarged audital bullæ and deeper brain-cases, are much the same as in *Thamnomys*, showing the same form of rostrum and zygomata and the same incipient postorbital processes. But their teeth can scarcely be distinguished from those of *Mus*, the number and arrangement of cusps being very similar. The third or postero-internal cusp of m^1 is undeveloped and the supplementary cusps of the lower molars are small and rudimentary as in *Mus*. It therefore seems best for the present to retain these species in the genus *Mus*.

Thamnomys baliolus, sp. n.

Type from Woodbush Hills, N.E. of Pietersburg, Transvaal. No. 6. 4. 3. 51, British Museum. Adult female. Collected December 13th, 1905, by C. H. B. Grant. Presented by C. D. Rudd, Esq.

Characters.—Size medium, about as in *Thamnomys surdaster*; pelage soft; colour dark. Skull and teeth small; zygomatic plate narrow and deeply concave anteriorly. Most similar to *T. surdaster*, but colour much darker and pelage softer; upperparts dark russet finely and thickly mixed with dusky; ears thinly haired and dark-coloured; postauricular white spot conspicuously contrasted; underparts pale creamy; hind feet white on the outer side and toes only, the inner side and the tarsal joint pale ochraceous; tail blackish all around, slightly more intense terminally. Skull similar in size to that of *T. surdaster*, but brain-case relatively large; audital bullæ larger; rostrum and infraorbital region weak; zygomatic plate narrow.

Measurements.—Type: total length 284 mm.; head and body 104; tail-vertebræ 180; hind foot (s. u.) 22; ear 18. Skull of type: greatest length 28.6; basilar length 21.2; zygomatic breadth 13.9; nasals 10.2; least interorbital width 4.6; postpalatal length 9.6; diastema 7.2; palatine slits 7; maxillary tooth-row 44.

Remarks.—This species belongs to the group in which the third or postero-internal cusp of m^1 is reduced to a narrow ridge. It is readily distinguished from all others of the group by its dark colour and the relatively weak anterior part of the skull. Like the other members of the group, it has the supplementary external cusps of the lower molars more highly developed than in *Mus*. The group as at present understood includes the following forms:—

Thamnomys dolichurus (Smuts).
T. ibeanus, Osgood.
T. ruddi, Thomas & Wroughton.
T. cometes, Thomas & Wroughton.
T. dryas, Thomas.
T. discolor, Thomas.

T. surdaster, Thomas & Wroughton.
T. s. polionops, Osgood.
T. s. elgonis, Thomas.
T. bahiolus, Osgood.
T. macmillani, Wroughton.
T. m. gazellæ, Thomas.

The smaller more typical group of *Thamnomys*, having the postero-internal cusp of m^1 more highly developed, includes only *T. venustus*, Thomas, *T. rutilans* (Peters), and *T. kuru*, Thomas & Wroughton.

Cricetomys gambianus poensis, subsp. n.

Type from Bubi Town, Bantaberi, Island of Fernando Po, Gulf of Guinea. No. 4.7.1.117, British Museum. Adult male. Collected February 7th, 1904, by E. Seimund. Original No. 83. Presented by the Fernando Po Committee.

Characters.—Similar to *C. gambianus* and *C. g. dolichops*, but with much less white on the tail; skull with a conspicuous palatal spine, a rather narrow zygomatic plate, and very small audital bullæ; otherwise as in *C. gambianus*. Upperparts dark brown, somewhat paler than in *dolichops*; sides of face considerably paler than back; underparts pure creamy white to the roots of the hairs, sharply contrasted with upperparts; feet white except a broad brown stripe in the median metatarsal region; proximal part of tail dark brown, occupying nearly three-fourths of the entire length of the tail; terminal fourth of tail soiled white.

Measurements.—Type: total length 690 mm.; head and body 312; tail-vertebræ 378; hind foot (s. u.) 65; ear 44. Skull of type: greatest length 74·8; basilar length 61·5; zygomatic breadth 32·6; nasals 30·5; least interorbital breadth 10·2; postpalatal length 23·8; diastema 24; palatine slits 7·4; maxillary tooth-row 10·6.

Remarks.—The most distinctive characters of this form are the extent of the dark colour on the tail and the presence of a well-developed spine on the posterior border of the palate. The palatal spine is constant in the nine specimens examined from Fernando Po. It is slightly developed in two skulls from Gold Coast, but others from Gold Coast, Liberia, and Gambia do not possess it nor is it found in any of the large number of specimens examined from Central and East Africa. The type of *gambianus*, which has been on exhibition for many years, is greatly faded and untrustworthy for colour-characters, except as to the proportion of light and dark on the tail. In this respect it differs markedly from *poensis*, the

white area occupying slightly more than half the length of the tail instead of scarcely one fourth.

Several recently collected specimens from Senegal agree with the type of *gambianus* in the proportion of light and dark on the tail and may safely be regarded as typical of the species. They indicate typical *gambianus* to be markedly different from the rich dark-coloured forms like *poensis* and *dolichops*. They are, in fact, the most greyish of the whole *gambianus* group and have the feet most extensively whitish.

Cricetomys gambianus dolichops, subsp. n.

Type from Como River, 70 miles from Gaboon, French Congo, West Africa. No. 97. 7. 1. 16, British Museum. Adult male. Collected February 25th, 1897, by G. L. Bates. Original No. 155.

Characters.—Darkest of the *gambianus* group; middle of back deep vandyke-brown, the hairs scarcely paler at the base than at the tip; proximal two-thirds of tail dark brown, terminal third white; underparts entirely pure white, very sharply contrasted with dark upperparts; white of underparts broadly extended on lower cheeks; facial region, forehead, and nape quite as dark-coloured as back; sides somewhat paler, approaching broccoli-brown.

Skull exceedingly elongate; rostrum very long, slender, and dorsally convex; teeth and audital bullæ small; palate smoothly rounded behind, without any indication of a spine; zygomatic plate rather broad and forwardly projected.

Measurements.—Type: total length 850 mm.; head and body 420; tail-vertebræ 430; hind foot (s. u.) 71; ear 38. Skull of type: greatest length 80·2; basilar length 66·9; zygomatic breadth 32·9; nasals 34·3; least interorbital breadth 10·4; postpalatal length 27·5; diastema 27·8; palatine slits 7·5; maxillary tooth-row 10.

Remarks.—Landana, the type locality of Rochebrune's *Cricetomys dissimilis* lies about halfway between that of the present form and that of *C. g. ansorgei* of Angola. Until specimens are obtained from this locality some doubt may attach to both *ansorgei* and *dolichops*, although the known variability of the group makes it extremely probable that Rochebrune's species will prove different from both. *C. g. dolichops* is most closely allied to *P. g. poensis*, from which it differs chiefly in its very elongate skull without a palatal spine.

Cricetomys gambianus dichrurus, subsp. n.

Type from Agouléné, Anambara River, South Nigeria, West Africa. No. 5. 12. 1. 21, British Museum. Adolescent

female. Collected July 22nd, 1905, by Robin Kemp. Original No. 4.

Characters.—Most similar to typical *Cricetomys gambianus*, but darker coloured; back more extensively dusky; sides and underparts with a strong tinge of vinaceous; dark brown areas on fore and hind feet more extensive, the white largely confined to the toes and the outer side of the hind feet; light and dark sections of tail about evenly divided. Skull small, with small molars and extremely small audital bullæ; rostrum short and decidedly convex between the maxillary branches of the zygomata; palate with a minute median posterior notch.

Measurements.—Type: total length 670 mm.; head and body 310; tail-vertebræ 360; hind foot (s. u.) 65; ear 38. Skull of type: greatest length 65·8; basilar length 55; zygomatic breadth 32·4; nasals 27; least interorbital breadth 10; postpalatal length 21·7; diastema 21·2; palatine slits 7·3; maxillary tooth-row (crowns) 10·7.

Remarks.—Instead of showing any resemblance to the dark coast forms *poensis* and *dolichops*, which are geographically near, this form is closely similar to the pale form of Senegal and Gambia, which it now appears is true *gambianus*. It seems quite possible that it ranges well into the interior, since two specimens from Mombattu, Northern Congo (Nos. 87. 12. 1. 52-53, B.M.), appear to be very closely allied to, if not identical with, it. These being from the same region as *P. g. emini*, which is a large-toothed form, suggests the possibility that the small-toothed forms of West Africa are distinct from the large-toothed ones of East and South Central Africa.

Cricetomys gambianus liberice, subsp. n.

Type from 50 miles inland from Monrovia, Liberia, West Africa. B.M. no. 4. 6. 2. 13. Old female. Collected by A. Whyte.

Characters.—Most similar to *Cricetomys gambianus poensis*, but colour slightly paler and skull somewhat different; tail more extensively white, the dark and light about in the proportion 3 : 2½; posterior border of palate without spine; ascending branches of premaxillæ broad; audital bullæ slightly larger than in *poensis*.

Measurements.—Skull of type: greatest length 74·5 mm.; basilar length 62·5; nasals 30·2; least interorbital breadth 9·9; postpalatal length 24; diastema 25·1; palatine slits 7·4; maxillary tooth-row (crowns) 9·9.

Remarks.—Although obviously deserving recognition, this form is at present represented by poor and scanty material. Two specimens from Liberia and one from Sierra Leone may be definitely referred to it. Yet only one of these (the type) possesses a skull and another is the prepared skin of an animal which lived in the Zoological Gardens some two years. The tail of the type is evidently abnormal in colour, being mixed brown and white for nearly its entire length, only the tips being pure white.

XXXIX.—*Further new African Mammalia.*

By OLDFIELD THOMAS.

(Published by permission of the Trustees of the British Museum.)

Thamnomys macmillani gazellæ, subsp. n.

Size and other essential characters as in true *macmillani*, but the fore back markedly lighter and greyer than the hind back, the ochraceous wash over the latter not or scarcely continued forwards beyond the middle of the back. Crown and ears also less buffy, the latter greyish brown, except for a small buffy spot at their anterior bases.

Skull as in *macmillani*, except that the anterior zygomatic plate is broader and projects in front of the upper bridge, while it runs vertically downwards from the latter in the Rudolf form.

Dimensions of the type (measured in the flesh):—

Head and body 112 mm.; tail 150; hind foot 22; ear 16.

Skull: palatal length 12·5; palatal foramina 5·8; zygomatic plate 2·7; upper molar series 4·1.

Hab. Chak-Chak, Bahr-el-Ghazal.

Type. Adult male. B.M. no. 8. 4. 2. 47. Original number 25. Collected 25th February, 1907, and presented by A. L. Butler, Esq. Two specimens.

The two Bahr-el-Ghazal specimens are precisely like each other, and equally different from the type of *T. macmillani* in the characters noted above.

An imperfect specimen from Fort Berkeley, on the Uganda Nile, seems also referable to the present form.

Thamnomys surdaster elgonis, subsp. n.

Size as in true *surdaster*. General colour markedly paler, more buffy and less ochraceous than in either *surdaster* or its

representatives in the central part of East Africa; most richly coloured part of rump barely "ochraceous buff," sides of rump "buff." Head as usual greyer. Sides of muzzle without dark whisker marks. An unusually well-marked buffy supraorbital spot. Ears dull buffy, a patch of dull whitish buffy on the crown internal to the ear. Hands white; front of forearms, whole of lower legs, and upper side of feet clear buffy.

Skull as in true *surdaster*.

Dimensions of the type (measured in the flesh):—

Head and body 115 mm.; tail 165; hind foot 23; ear 17.

Skull: greatest length 29; zygomatic breadth 14; inter-orbital breadth 4.5; palatal length 13.6; length of upper tooth series 4.5.

Hab. Mt. Elgon. Type from Malikisi, 5000'. An immature specimen from Kirui, 6000'.

Type. Adult male. Rudd Collection. Original number 478. Collected 29th November, 1909, by Robin Kemp.

This Elgon Bush-mouse is readily distinguishable by its pale colour and buffy supraorbital spots from the form of *T. surdaster* which occurs in the central region of British East Africa. Like true Nyasa *surdaster* it has no dark whisker marks.

Thamnomys discolor, sp. n.

A dark-coloured species of the *dryas-surdaster* section of the genus, with grey head, buffy under side, and parti-coloured feet.

Size rather small. General tone dark brownish, the brightest part of the hinder back cinnamon. Under surface white, tinged with buffy, the sides of the belly each with a broad and conspicuous pinkish-buff line edging the darker colour of the sides, and extending inwards nearly across the belly. Face dark grey (about grey no. 5) markedly contrasted with the fulvous brown body-colour which extends forward to the crown. No dark whisker marks or light supraorbital spots. Ears dull buffy. Front of forearms grey. Hands bright buff, an indistinct slaty patch on the metacarpus. Hind legs dull fulvous behind, their inner aspect pinkish buff in continuation with the buffy lateral lines; upper surface of feet buff, with a large patch of brownish grey on the outer half (inner in the prepared skin) of each metatarsus.

Size of teeth about as in *T. surdaster*.

Dimensions of the type (measured in skin):—

Head and body 115 mm.; tail 176; hind foot 23.5.

Length of nasals 9; interorbital breadth 4.2; length of upper molar series 4.1.

Hab. Kakamega Forest, Kisumu, British East Africa. Alt. 4500'.

Type. B.M. no. 6. 5. 6. 5. Collected and presented by F. W. Isaac, Esq.

Readily distinguishable by its abruptly grey head, parti-coloured feet, and the conspicuous buffy lines down each side of its belly.

DESMOMYS, gen. nov.

External characters and general shape of skull as in *Pelomys* and *Mylomys*, but molars of a structure approaching that found in *Ænomys*.

Proportions and general external appearance about as in *Pelomys*. Pollex minute, with a rudimentary nail; fifth fore toe either with a very short claw (*dembeensis*) or a nail (*harringtoni*). Fifth hind toe little longer than the hallux.

Skull of the peculiar shape, short-muzzled and bowed above, characteristic of *Arvicanthis*, *Pelomys*, and *Mylomys*, quite different to the long flattened skull of *Ænomys*.

Incisors faintly and inconspicuously grooved, equally different from the strongly grooved incisors of *Pelomys* and *Mylomys*, and the smooth convex ones of *Arvicanthis* and *Ænomys*.

Molars, while not so extreme, yet showing a strong resemblance to those of *Ænomys*. The cusps are not so high, but there is a similar tendency to the development of fine enamel ridges running backwards from the main cusps in the line of the tooth-row, and tending to obliterate the essential laminate structure. From this it results that certain cusps, notably the postero-external and postero-internal, of both m^1 and m^2 , instead of being roughly circular in section as in *Pelomys*, are almost "guttate" (Ridgway, pl. xiv. fig. 8), with a long pointed angle behind. Lower molars with the cusps directed forwards somewhat as in *Mylomys*; second lamina of m_3 little narrower than the anterior lamina, strongly notched posteriorly, so as to form two cusps, of which the inner is rather the larger.

Type. *D. harringtoni* (*Pelomys harringtoni*, Thos.).

Other species—*Mus dembeensis*, Rüpp.

The species for which I now propose a special genus have always been a puzzle, and *dembeensis* has in turn been referred to *Mus*, *Arvicanthis*, *Golunda*, *Pelomys*, and *Ænomys*. They combine in a curious way the general characters of *Pelomys* with a tendency to the peculiar tooth-structure of *Ænomys*, to which they have no resemblance in other respects.

Procavia emini latrator, subsp. n.

Essential characters as in true *emini*, but whereas in that animal the body hairs are slaty blackish for their basal four-fifths and broadly tipped with buffy, in the present form they are white or whitish for their basal half, and only subterminally ringed with blackish. The tips of the hairs are similarly buffy, and in general appearance the two animals are exactly the same, as the white bases of the hairs do not show through the dark subterminal rings. Under surface dull creamy. Eyes with rather more prominent white superciliary lines. A small whitish or buffy patch on the occiput. Hairs round ears pale buffy. Dorsal patch large, loose, ill-defined, some of its hairs creamy throughout, and others cream terminally, blackish mesially, dull whitish basally. Limbs dull buffy or pale brownish.

Skull typically that of a *Dendrohyrax*. Orbits closed by bone behind. Teeth small and brachyodont.

Dimensions of the type (in skin) :—

Head and body 540 mm.

Skull (stage vi.) : basal length 92 ; greatest breadth 52 ; breadth of m^1 5·8.

Hab. Batempa, Upper Sankuru River, Southern Central Congo.

Type. Female in stage vi. B.M. no. 9. 12. 12. 10. Collected and presented by E. Torday, Esq. Three specimens.

The British Museum owes to Viscount Montmorres two native skins from the Stanley Forest, Upper Congo, and to Dr. Cuthbert Christy one from the Mabira Forest, N.W. Uganda, all of which I refer to *Procavia emini*, described by me in 1887 from a young specimen.

In comparison with these the S. Congo specimens presented by Mr. Torday are readily distinguishable by the broad white bases to the dorsal hairs. In one example, however, some of the hairs on the withers are dark to their bases, as in true *emini*, and it is probable therefore that the two forms will be found to grade into each other, and I therefore only distinguish them subspecifically.

XL.—*Two new Species of African Dormice belonging to the Genus Graphiurus.* By GUY DOLLMAN, B.A.

(Published by permission of the Trustees of the British Museum.)

Graphiurus lorraineus, sp. n.

A bright buffish-brown species, about the same size as *Graphiurus raptor*, Dollm.

Size of body intermediate between that of the small members of the genus and the *murinus* group. Ears comparatively small, measuring only about 10 mm. in length. Fur rather short, not more than 6 or 7 mm. in length on the back and hind-quarters. General colour of dorsal surface bright buffish brown (between cinnamon no. 1 and burnt umber no. 1, 'Repertoire de Couleurs'), strikingly different from any other member of the genus. Flanks very much the same colour as back, rather paler towards the ventral surface. Individual hairs of back slaty grey, with bright yellowish-buff tips. Face and top of head similar in colour to back. Sides of face, below eyes, buffish white; hairs with greyish bases and white tips. Upper lip covered with short yellowish-white hairs. Eyes surrounded with indistinct brownish rings; dark markings on sides of muzzle, in front of eyes, rather ill-defined, a great deal less noticeable than in *G. murinus*. Backs of hands and feet yellowish white. Under surface of body greyish white, washed over with buff. Individual hairs of belly slaty grey, with yellowish-white tips. Hairs on chin and lower lip white. Tail broken; the terminal portion appears to have been bushy. Tail above rather browner in colour than back; lower surface greyish brown.

Skull short and broad, with comparatively large teeth. Nasals rather short; auditory bullæ large and inflated.

Dimensions of the type (measured in the flesh):—

Head and body 95 mm.; tail 62; hind foot 14; ear 10.

Skull (occipital region broken): tip of nasals to back of interparietal 24·7; greatest zygomatic breadth 14·5; breadth of cranium (across squamosal region) 12·2; length of nasals 9·5; greatest breadth across nasals 3·4; least breadth across nasals 2; interorbital breadth 5; palatal length 10·5; palatal length 8; width of palate (inside *m*¹) 3·5; width across palate (outside *m*¹) 5·5; length of palatal foramina 2·8; length of upper cheek-teeth 3·4.

Hab. Molegbwe, south of the Setema Rapids, Welle River, Congo.

Type. Adult female. B.M. no. 7. 7. 8. 115. Original number B.A. 42. Collected by Capt. Boyd Alexander on December 14th, 1905. Presented by the Alexander-Gosling Expedition.

This species is easily distinguished from the other members of the genus by the brilliant buff coloration of the upper parts of the body, the comparatively small ears, and short and rather stoutly built skull.

Graphiurus brockmani, sp. n.

A medium-sized form allied to the foregoing species, but rather smaller in size, very much paler in colour, and with larger ears.

Size of body rather less than in *G. lorraineus*, tail about equal in length to that of the head and body together; ears comparatively large. Fur soft and of medium length. General colour of upper surface of body pale buffish brown (snuff-brown no. 1 mixed with smoke-grey no. 1, 'Repertoire de Couleurs'), rather darker down the middle of the back. Flanks very similar in colour to back, the buffish brown of the dorsal surface sharply marked off from the white coloration of the belly. Individual hairs of back dark slaty grey, with light buffish-brown tips; many of the longer hairs, especially on the posterior part of the back, with dark brownish tips. Muzzle, and face between eyes, similar in colour to back. Eyes surrounded by rather inconspicuous brownish rings. Dark markings on muzzle, in front of eyes, almost entirely absent. Cheeks white, the hairs white throughout, as in *G. parvus*, True. Sides of neck below ears white; hairs dark slaty grey, with long white tips. Backs of hands and feet covered with short white hairs. Under surface of body white tinted with cream (creamy white no. 1, 'Repertoire'). Hairs of belly dark slate-black with long white tips. Hairs on chin and lower lip white. Tail more or less cylindrical at base, gradually becoming bushy towards the tip, but never to such a marked degree as in *G. microtis*, Noack, the hairs at the extreme tip measuring about 14 mm. in length. Upperside of tail greyish chocolate, hairs brownish drab, with white tips; under surface lighter in colour, owing to the white tips being longer and more prominent.

Skull rather similar to that of *G. lorraineus*, but smaller and with shorter nasals. Teeth very small, the upper cheek-teeth measuring only 3 mm. in length. Auditory bullæ comparatively large and inflated.

Dimensions of the type (measured in the flesh):—

Head and body 81 mm.; tail 80; hind foot 15; ear 16.

Skull (occipital region broken): basal length 21.5; basilar length 18.5; greatest zygomatic breadth 14; breadth of cranium (across squamosal region) 11.5; greatest length of nasals 8.8; greatest breadth across nasals 3.3; least breadth across nasals 2; interorbital breadth 3.7; palatal length 10; palatilar length 7.5; width of palate (inside *m*¹) 3; width

across palate (outside m^1) 5; length of palatal foramina 3; distance from palation to basion 11·3; length of upper cheek-teeth 3.

Hab. Burao, Somaliland. Altitude 4000 feet.

Type. Adult male. Collected by Mr. Bury on March 1st, 1906.

This Somaliland dormouse is so very much paler in colour than any of the allied species, and presents so many striking cranial differences, that it must be regarded as representing a distinct species. In addition to the type the Museum possesses three other specimens from the same locality, all very similar to the type in colour and dimensions.

It gives me great pleasure to name this handsome species after Dr. Drake Brockman, to whom mammalogical science is already indebted for much useful work in connection with the fauna of Somaliland.

XLI.—*Further Notes on Merlia normani, Kirkp.*

By R. KIRKPATRICK.

(Published by permission of the Trustees of the British Museum.)

AT the end of a communication ('Annals,' July 1909, p. 48), entitled "Notes on *Merlia normani*, Kirkp.," I stated that "The definition of *Merlia* must be emended in a future paper." After examining 100 or more slides with over 2000 good sections of *Merlia* prepared from well-preserved specimens varying in size and age, I have come to the conclusion that *Merlia normani* is a sponge with a siliceous and calcareous skeleton. The absolutely convincing proof, such as would be afforded by seeing an embryo settle down and develop the siliceous and calcareous elements, is not at present forthcoming, though I hope, by visiting Porto Santo Island at different periods of the year, to obtain that evidence. I have, however, beautiful sections of a young sponge which can only be a few days old and which possesses all the elements found in the adult condition.

The evidence is so strong in favour of the view here expressed, that I can now see no possibility of coming to any other conclusion. To put the matter as briefly as possible, the reasons for this belief are as follows:—

I have dredged up numerous fresh living specimens, and have always found the same elements, viz. a sponge, in

which siliceous spicules are present, growing in a calcareous honeycomb-like framework constructed of vertical tubes with perforate horizontal tabulæ. The upper part of *Merlia* resembles an ordinary siliceous sponge. The lower part in the "crypts" * or honeycomb spaces is composed mostly of very large granular cells, more or less separated by connective-tissue cells, the whole being in continuity, through the central orifice usually present in each tabula, with the tissues of the upper part of the sponge.

Further, the masses of crypt-cells are surrounded by a kind of epithelium. The large crypt-cells have *not* grown down into the crypts, but have developed in the position in which they are found: for I have seen, by a process of grinding down, crypts at the base of the sponge full of crypt-cells, and, after having destroyed the latter with Eau de Javelle, have often seen the orifice in the roof of the crypt, *i. e.* in the tabula, narrowed to the smallest slit sometimes no more than $1\ \mu$ in width. As some of the crypt-cells are about $200\ \mu$ in area end on, it would be ridiculous to assume that these huge masses of huge cells have grown down through five or six stories and squeezed their way through slits sometimes only $1\ \mu$ in diameter. Moreover, the crypt-cells are not loose and isolated, but enmeshed in a network of connective tissue and surrounded by a kind of epithelium.

In some ground-down sections of the skeleton I have seen tabulæ absolutely imperforate, but I had not observed whether the crypts thus roofed over had contained cells or not.

Accordingly *Merlia* is not a parasite growing over and into a calcareous organism, and it is not a Foraminiferan. Further, it is certainly not a Cœlenterate or a Polyzoon. In fact, it is now beyond a doubt seen to be a sponge and nothing but a sponge.

Merlia is of unique interest, not only in itself, but also on account of the resemblance, in some respects, of its calcareous skeleton to certain of the Monticuliporas.

Not only is there, on surface view, a polygonal reticulum with tubercles at the nodes of the meshes, and not only are there tabulæ with a central hole, but there are radial sutural markings precisely as in *Rhaphidopora* (*Chaetetes*) *stromatoporoïdes*, Roemer (Nicholson and Foord, "On a new Genus of Devonian Corals," *Annals & Mag. N. H.* (5) xvii. 1886, p. 393, pl. xvi. fig. 5). Of course these resemblances may be merely homœomorphous.

* The useful terms "crypt" and "crypt-cell" were suggested by Prof. E. A. Minchin. The cells, which look like large granular gemmule cells, appear to me to be probably "calicoblasts."

The problem of the position of the *Monticuliporas* has baffled several generations of geologists and zoologists, who have regarded them as Foraminifera, Sponges, Cœlenterata, or Polyzoa. At last a living organism has been found with a skeletal structure showing many resemblances to these Palæozoic fossils.

Sir John Murray informs me that he has seen a dry specimen of a coral-like organism from the West Indies in some respects like *Merlia*, and Prof. Stanley Gardiner has obtained from the Indian Ocean somewhat similar specimens also dried. These organisms have been spoken of as Foraminifera or Alcyonarian Corals. Unfortunately, dried specimens afford scarcely more information than that which is available for the palæontologist. I can only say that if the specimens referred to are related to *Merlia* they are sponges. I have seen in the British Museum a Foraminiferan from the Indian Ocean with a surface reticulum and nodal tubercles, but the skeleton is obviously Foraminiferan.

I originally described *Merlia* as a Pharetron sponge ('Annals,' Dec. 1908, p. 510). Later ('Annals,' July 1909, p. 47), I concluded that the upper part was a distinct siliceous sponge, and at one time the organism seemed to me to be an example of symbiosis between a siliceous and a degenerate Pharetron sponge. Huxley, in his essay on Hume, remarks that if anyone stated that he had seen a Centaur careering about in Piccadilly, we would feel justified, even if we believed in the good faith and acumen of the narrator, in demanding very strong proofs. If the statement were accepted, we would perhaps wonder whether the Centaur were a Horse-Man, a Man-Horse, or possibly, from some lurking doubt as to the observing powers of the narrator, only a Man on a Horse.

It is at present believed that the Sponge Phylum originally divided into three main branches (Calcarea, Triaxonia, Tetra-xonia), and that the division between Calcareous and Siliceous Sponges extends deep down to the very roots. The existence of a sponge with a calcareous and a siliceous skeleton had seemed to me almost as improbable as that of a Centaur. So it was not surprising that *Merlia* was regarded by me to be an instance of symbiosis on a parallel with the Man-on-the-Horse theory of the Centaur, and that I was misled into establishing the genus *Noronha*, which must now become a *nomen nudum*.

The theory that *Merlia* is a siliceous sponge that has "taken on" the function of forming a calcareous skeleton appears at first sight to commend itself, because we seem able to locate the sponge in a particular group of Monaxonellida,

and, further, the flagellated chambers and collar cells resemble those of Tetraxonid Sponges. Prof. Minchin has reminded me of the tendency of gemmule cells to accumulate at the base of a sponge, and has suggested that possibly the calcareous structure may be of the nature of a protective coating for gemmule cells. There are considerable difficulties, however, in the way of accepting this ingenious theory.

All that it was intended to bring out in these notes was the fact that *Merlia* is a sponge with a siliceous and calcareous skeleton, and that we are justified in assuming that there is now more evidence—slight as it still is—in favour of the theory that some Monticuliporas are Sponges than in that of any other theory as to the nature of these fossils.

A full account of *Merlia* with figures will shortly be published in the 'Quarterly Journal of Microscopical Science.'

XLII.—*Description of a new Species and a new Subspecies of European Bats.* By G. E. H. BARRETT-HAMILTON.

THERE is in the British Museum of Natural History a bat taken in Roumania by the late W. Dodson, and having the general appearance of a small Serotine. I have long suspected this to be the first known example of a hitherto undetected species, but dared not describe it on the strength of a single specimen. Recently, however, Mr. Gerrit S. Miller, Jun., has had the courtesy to send me for comparison a similar although somewhat larger specimen from the collection of the United States National Museum, taken at St. Gothard, Switzerland. I have now, therefore, no hesitation in describing the new species as follows:—

Vespertilio sodalis, sp. n.

This bat resembles *V. serotinus* of Europe in general appearance, proportions and colour, but is smaller. The teeth are relatively larger though not so broad, the length of the cheek-series being actually about as long as in *V. serotinus*. The skull is relatively stouter and shorter and the cranium rounder and more inflated than in *V. serotinus*.

In colour the two specimens are dissimilar. In both the ears and membranes are, as usual, dusky. In the Roumanian bat the upperside is near "Prout's brown," the hairs being tipped with tawny, especially on the lower back; the underside is near "isabella color." The Swiss bat is everywhere

much lighter, the upperside being near "russet"*, with tawny hair-tips, and the underside unicoloured deep "buff." The face, ears, and wings are very sparsely haired.

The dimensions of the two specimens in millimetres (the Roumanian bat first) are as follows:—

Head and body 63†, 76†; tail 42†, 32†; ear 18†, 14+†; tragus, 6, 8†; thumb without claw 6+, 8†; fifth metacarpal 39+, 40+; fourth metacarpal 40+, 41; third metacarpal 41, 43; forearm (extreme length) 46, 48; lower leg 19+, 19+; hind foot (without claws) 8+, —.

Skull: greatest length 19, —; basal length in middle line 14, —; palatal length in middle line 7, 8; from posterior border of m^3 to anterior border of canine 6+, 7; same in lower jaw —, 8; greatest breadth at zygoma 13.5, —; posterior breadth 8.5, 9; breadth between orbits 8, 8; breadth at constriction 4+, 4. Blanks in the dimensions indicate that the skulls are damaged.

The type is a male, no. 4. 4. 6. 1 of the British Museum collection, taken at Bustenari, Roumania, on the 24th April, 1899, by W. Dodson, collecting for the late Lord Lilford. It was shot in a wood, where the collector obtained also some Serotines. The second specimen, also a male, is no. ¹²³³³ ₃₇₂₉₅ of the U.S. Nat. Museum collection, from St. Gothard, Switzerland.

The existence of a second and smaller bat of the Serotine type in Europe is of some interest in view of Mr. Miller's recent demonstration that *Myotis oxygnathus* of Monticelli is practically a small *M. myotis*. It recalls also the relations of *Nyctalus noctula* and *N. leisleri*.

Rhinolophus ferrum-equinum insulanus, subsp. n.

Dr. Andersen's acceptance of Cabrera's *R. ferrum-equinum obscurus* as a small subspecies makes the treatment of the British Greater Horseshoe Bat somewhat difficult. The latter is undoubtedly smaller than the typical continental form, but its dimensions come so close to those of *R. f.-eq. obscurus* that distinction of the two would be difficult even on the average. But even granted that they are apparently identical, these two colonies are geographically separated and represent independent assumption of similar dimensions, recalling to a

* Names of colours in inverted commas are from Ridgway's 'Nomenclature of Colors,' 1886.

† Collector's measurements.

‡ Measured in dry skin.

certain extent the case of the Lesser Horseshoe, in which the existence of two small forms, one Mediterranean, the other British, is not disputed. It seems, then, incorrect and impossible to identify British Greater Horseshoes with Spanish *obscurus*, while, on the other hand, Andersen's exact arrangement of the members of this genus precludes their identification with the typical form.

I understand that some naturalists do not recognize the validity of *R. f.-eq. obscurus*, and on that view the case for the subspecific distinction of the British Greater Horseshoe becomes even stronger, and I feel compelled to give it subspecific rank. It may be known as *R. ferrum-equinum insulanus*.

This bat resembles *R. ferrum-equinum ferrum-equinum* of Europe in every respect, but has smaller wings.

The skull-measurements about equal those of *R. f.-eq. ferrum-equinum*.

The following are the average dimensions of a series :—

	Head and body.	Ear, greatest length.	Nose-leaf, greatest length and greatest breadth.	Tail.	Lower leg.	Hind foot without claws.	Forearm.	Thumb and claw.	Longest digit.	Metacarpal iii.	Metacarpal v.	Greatest expanse of wings.
Approximate average of eleven males ..	63.2	22	14.7 × 8.1	32	24.5	11.2	53.6	6.1	83.4	35.4	38.9	334.6
Approximate average of five females ..	65.8	22.1	14.1 × 8	33.2	25.3	11.8	54.5	6.9	85.8	36.2	40.5	350

The dimensions of the type are as follows (measured from alcohol) :—

Head and body 63 mm.; ear, greatest length, 21.5; nose-leaf, greatest length and breadth, 14 × 7 +; tail 31; lower leg 25; hind foot without claws 10.5; forearm 54; thumb and claw 6; longest digit 83.5; metacarpal iii. 36; metacarpal iv. 38; metacarpal v. 40.

Skull: greatest length 24; basal length in middle line 19; palatal length in middle line 8; from posterior border of *m*³ to anterior border of canine 8.75; ditto in lower jaw 9.75; greatest breadth at zygoma 12; posterior breadth 9; breadth between orbits 8; breadth at constriction 3.

The type is no. 7. 1. 10. 3 of the British Museum collection, a male in alcohol. It was taken by Mr. T. A. Coward in the caves at Cheddar, Somersetshire, in January 1907.

BIBLIOGRAPHICAL NOTICE.

Third Annual Report of the Committee of Control of the South African Central Locust Bureau. Respectfully submitted by the Committee to the several Governments supporting the Bureau. Prepared for publication and edited by CHAS. P. LOUNSBURY, Government Entomologist, Cape of Good Hope. 8vo. Cape Town, 1909. Pp. 68.

THE above-mentioned Bureau was established by the joint action of the several British colonies and territories of South Africa in 1906, after the country had been ravaged by locusts for twelve or fifteen consecutive years; and it is now supported by all the British territories, as well as by Mozambique and German South-west Africa. The Report before us deals with the locust season of 1908-9. Although a great number of species of locusts inhabit South Africa, it appears that the two principal destructive species are *Pachytylus rubricollis*, Stål, and *Cyrtacanthacris septemfasciata*, Serv., called here respectively the Brown- and the Red-winged Locusts. The former, the oldest name for which is *Pachytylus pardalinus*, Walker, is congeneric with the real *Pachytylus migratorius* of Linnæus; the latter belongs to a different section of the true Locusts or Short-horned Grasshoppers. Both species have latterly been much less destructive than formerly, owing to the energetic measures taken against them; and even on the Zambesi, where the Red-winged Locust is very destructive and less effectually combated than in the south, it is estimated that a probable loss of crops worth £250,000 was prevented this year. On one sugar-cane plantation of about 3300 acres fourteen tons of eggs were dug out. The use of poisons and the services of locust-eating birds (inclusive of stork-migrants from Europe) are also discussed, and numerous reports from various parts of South Africa are printed. The Report may be commended to the favourable attention of both naturalists and agriculturists.

PROCEEDINGS OF LEARNED SOCIETIES.

GEOLOGICAL SOCIETY.

December 1st, 1909.—Prof. W. J. Sollas, LL.D., Sc.D., F.R.S., President, in the Chair.

The following communication was read:—

‘The Tremadoc Slates and Associated Rocks of South-East Carnarvonshire.’ By William George Fearnside, M.A., F.G.S., Fellow of, and Lecturer in Natural Sciences at, Sidney Sussex College, Cambridge.

This paper gives the results which have been obtained by the Author in making a detailed map of the country about Portmadoc,

Tremadoc, and Criccieth in Carnarvonshire, and describes the stratigraphy of the Cambrian and Ordovician rocks there exposed. The area described includes the original type-area of the Tremadoc Slates (Sedgwick & Salter), and the paper includes a detailed account of the local development of this well-known series.

The first part of the paper is devoted to a brief summary of the results attained by former workers, and is arranged to show the various stages through which the nomenclature of the major subdivisions of the Cambrian and Ordovician Systems have evolved.

The sedimentary series are described in the order of their formation. The succession may be tabulated as follows:—

	Western or Criccieth District.	Eastern or Tremadoc District.
CARADOC SERIES.	Rhyolitic ashes and agglomerates. Variable dark-grey and black shivery slates, banded, but with no distinguishable horizons.	Grey slate series, often strongly banded, with a few shelly fossils (<i>Trinucleus</i> and <i>Orthis</i>) in the upper part. Andesitic ashes and ashy shales. Vesicular andesites.
LLANDEILO SERIES.	Dark banded slates with intense cleavage; no fossils found. Earthy slates, with occasional 'tuning-fork' graptolites.	Blue-black slates containing graptolites. Zone of <i>Nema-graptus gracilis</i> .
ARENIG SERIES.	Shivery slates passing down into flaggy grits yielding <i>Calymene parvifrons</i> . Basal conglomeratic grit.	Conglomeratic grit of Ynys Towy.

Unconformity.

TREMADOC SERIES.	Garth Hill Beds:	Not complete in the area studied.
	Grey-blue slates with <i>Angelina</i> .	
	Penmorfa Beds:	
	Flaggy mudstones and thinly-bedded slates with <i>Shumardia</i> and the Shineton fauna.	
	Portmadoc Beds:	
	Thickly-bedded felspathic slates, with occasional <i>Asaphellus</i> .	
	Moel-y-gest Beds.	
	Banded grey slates and mudstones; few fossils, <i>Acrotreta</i> and <i>Bellerophon</i> .	
	The <i>Dictyonema</i> Band:	
	A constant and characteristic band of bright rusting blue-grey mudstones, with abundant <i>Dictyonema sociale</i> .	
	Tynllan Beds:	
	Thinly-bedded rusty shales with some hard grey mudstone bands, containing <i>Niobe</i> and <i>Psilocephalus</i> . (<i>Symphysurus</i> .)	

DOLGELLY SERIES.	{	Sooty-black mudstones with <i>Peltura scarabæoides</i> .
		Blue-black mudstone with <i>Agnostus trisectus</i> .
		Black slates, with calcareous bands often crowded with <i>Orthis lenticularis</i> .
		Dark flaggy slates with <i>Parabolina spinulosa</i> .
FFESTINIOG SERIES.	{	Grey-blue slates and flags crowded with <i>Lingulella davisii</i> .
		Grey flags and grauwacké with some coarser bands (1800 feet thick).
MAENTWROG SERIES.		Rusty grey and blue slates with thin bands of felspathic grauwacké.

The folding, the cleavage, the faulting, and the jointing of the rocks are described, and an attempt is made to show some relationship between the various stress-phenomena which have produced these structures.

The great fault through Penmorfa is interpreted as a thrust-plane hading gently to the north-east. It is described as bounding two districts which are of very different structural type, and is supposed to form the lowest sole of the group of thrust-planes which follow the southern margin of the Snowdonian mountain-tract.

The well-known pisolitic iron-ore of Tremadoc is shown to follow the line of this fault, and is thought by the Author to be of the nature of a metasomatic veinstone.

Direct evidence of overthrusting has been got from a study of the graptolite-bearing Llandeilo rocks of Tyddyn-diewm, which have been exposed in two artificial trenches dug for the purpose; and the distribution of the andesitic volcanic series in lines of detached lenticles among the Grey Slates is described as evidence of a similar reduplication of the newer rock-series of the north-eastern district on a more extended scale.

The actual lines of major thrust-planes, other than the Penmorfa Fault, have not been discovered; but, from the broad-spreading character of the sills of gabbroid dolerite, the Author infers that these have come in along the thrust-planes.

The petrographical characters of these quartziferous and hypersthene-bearing dolerites are not dealt with, but it is noted that the dolerites are (1) unaffected by cleavage and faulting; and (2) have metamorphosed rocks which were already cleaved, cut, and reduplicated by the thrust-faulting at the time of their intrusion: in this the Author joins issue with previous observers in regard to their age.

The Glacial and post-Glacial accumulations are also described in outline.

THE LONDON, EDINBURGH, AND DUBLIN

PHILOSOPHICAL MAGAZINE

AND

JOURNAL OF SCIENCE.

A JOURNAL DEVOTED TO PHYSICS, ASTRONOMY, MECHANICS,
CHEMISTRY, MINERALOGY, AND THE ALLIED SCIENCES.

MONTHLY, PRICE 2s. 6d.

Complete sets (unbound) may be obtained. Prices on application.

The *First Series*, in 68 volumes, from 1798 to 1826. A few imperfect copies only on hand.

The *Second Series*, in 11 volumes, from 1827 to 1832.

The *Third Series*, in 37 volumes, from 1832 to 1850.

The *Fourth Series*, in 50 volumes, from 1851 to 1875.

The *Fifth Series*, in 50 volumes, from 1876 to 1900.

TAYLOR and FRANCIS, Red Lion Court, Fleet Street.

THE ANNALS AND MAGAZINE

OF

NATURAL HISTORY,

INCLUDING

ZOOLOGY, BOTANY, AND GEOLOGY.

MONTHLY, PRICE 2s. 6d.

Complete sets (unbound) may be obtained at the following prices:—

The <i>First Series</i> , in 20 volumes, from 1838 to 1847.	Price £10.
The <i>Second Series</i> , in 20 volumes, from 1848 to 1857.	„ £10.
The <i>Third Series</i> , in 20 volumes, from 1858 to 1867.	„ £12.
The <i>Fourth Series</i> , in 20 volumes, from 1868 to 1877.	„ £12.
The <i>Fifth Series</i> , in 20 volumes, from 1878 to 1887.	„ £12.
The <i>Sixth Series</i> , in 20 volumes, from 1888 to 1897.	„ £12.

TAYLOR and FRANCIS, Red Lion Court, Fleet Street.

CONTENTS OF NUMBER 27.—*Eighth Series.*

	Page
XXXII. Some Notes on the Life-history and Rate of Growth in <i>Gobius minutus</i> . By EDWARD SHANN, B.Sc., Gatty Marine Laboratory, St. Andrews. (Plates IX. & X.)	217
XXXIII. A Collection of Mammals from Eastern Buenos Ayres, with Descriptions of related new Mammals from other Localities. By OLDFIELD THOMAS	239
XXXIV. Remarks on Prof. L. von Méhely's recent Contribution to the Knowledge of the Lizards allied to <i>Lacerta muralis</i> . By G. A. BOULENGER, F.R.S.	247
XXXV. Descriptions and Records of Bees.—XXVI. By T. D. A. COCKERELL, University of Colorado.....	256
XXXVI. On new Species of West-African <i>Culicidæ</i> . By Dr. W. M. GRAHAM	264
XXXVII. Two new Duikers related to <i>Cephalophus abyssinicus</i> and a new <i>Dendromus</i> from Mt. Elgon. By R. C. WROUGHTON	273
XXXVIII. Eight new African Rodents. By WILFRED H. OSGOOD.	276
XXXIX. Further new African Mammalia. By OLDFIELD THOMAS	282
XL. Two new Species of African Dormice belonging to the Genus <i>Graphiurus</i> . By GUY DOLLMAN, B.A.	285
XLI. Further Notes on <i>Merlia normani</i> , Kirkp. By R. KIRKPATRICK.....	288
XLII. Description of a new Species and a new Subspecies of European Bats. By G. E. H. BARRETT-HAMILTON	291

BIBLIOGRAPHICAL NOTICE.

Third Annual Report of the Committee of Control of the South African Central Locust Bureau. Prepared for publication and edited by CHAS. P. LOUNSBURY, Government Entomologist, Cape of Good Hope	294
---	-----

PROCEEDINGS OF LEARNED SOCIETIES.

Geological Society	<i>ib.</i>
--------------------------	------------

* * It is requested that all Communications for this Work may be addressed, post-paid, to the Care of Messrs. Taylor and Francis, Printing Office, Red Lion Court, Fleet Street, London.

THE ANNALS
AND
MAGAZINE OF NATURAL HISTORY,
INCLUDING
ZOOLOGY, BOTANY, AND GEOLOGY.



CONDUCTED BY

ALBERT C. L. G. GÜNTHER, M.A., M.D., Ph.D., F.R.S.,
WILLIAM CARRUTHERS, Ph.D., F.R.S., F.L.S., F.G.S.,

AND

WILLIAM FRANCIS, F.L.S.

BEING A CONTINUATION OF THE "ANNALS" COMBINED WITH
MESSRS. LOUDON AND CHARLESWORTH'S "MAGAZINE OF NATURAL HISTORY."

WITH ONE PLATE.

Illustrative of Mr. R. Kirkpatrick's Paper on the Affinities of
Astrosclema willeyana, Lister.

LONDON:

TAYLOR AND FRANCIS, RED LION COURT, FLEET STREET.

Sold by Simpkin, Marshall, Hamilton, Kent, & Co., Ltd.; Baillière, Paris;
Hodges, Figgis, & Co., Dublin; and Asher, Berlin.

THE FAUNA OF BRITISH INDIA, INCLUDING CEYLON AND BURMA.

Published under the authority of the Secretary of State for India in Council.

Edited by A. E. SHIPLEY, M.A., F.R.S.

Med. 8vo, with text illustrations and 10 plates. Price 10s.

DERMAPTERA (EARWIGS). By Dr. MALCOLM BURR, M.A., F.L.S.

TAYLOR and FRANCIS, Red Lion Court, Fleet Street, E.C.

BIOLOGIA CENTRALI-AMERICANA.

Edited by F. DUCANE GODMAN.

SUBJECTS IN PROGRESS.

ZOOLOGY.

- Chilopoda and Diplopoda.** By R. I. POCKOCK. (Pp. 1-200, pls. i.-xv.)
Coleoptera. Vol. IV. part 3 (RHYNCHOPHORA: Curculionidæ). By D. SHARP. (Pp. 1-168, pls. i.-vi.)
Coleoptera. Vol. IV. part 7 (RHYNCHOPHORA: Curculionidæ, *continued*). By G. C. CHAMPION. (Pp. 1-78, pls. i.-iii.)
Lepidoptera Heterocera. Vol. IV. By LORD WALSLINGHAM. (Pp. 1-24, pl. i.)

The Price of each Part is 21s.

London: Published for the Editor by DULAU & Co., Soho Sq., W.

Just published. March.—Price 21s.

PART XI. OF

LAND AND FRESHWATER MOLLUSCA OF INDIA.

By Lieut.-Col. H. H. GODWIN-AUSTEN, F.R.S., &c.

With 15 Plates and 70 pages Text, with descriptions of many new
Species belonging to the Genera:

Macrochlamys, Euaustenia, Cryptaustenia, Eurychlamys,
Austenia, Durgella, Leptodontarion, Sakiella, Pseudo-
kaliella, Sarika, Euplecta, and Pupisoma.

TAYLOR and FRANCIS, Red Lion Court, Fleet Street, E.C.

THE ANNALS
AND
MAGAZINE OF NATURAL HISTORY.

[EIGHTH SERIES.]

No. 28. APRIL 1910.

XLIII.—*Rhynchotal Notes*.—L. By W. L. DISTANT.

Fam. *Fulgoridæ*.

Subfams. *ACANALOIINÆ* and *FLATINÆ*.

IN 1901–1902 Dr. Melichar published his ‘*Monographie der Acanaloniiden und Flatiden*,’ which was rightly welcomed by all homopterists. He, however, did not see the numerous types of Walker belonging to these subfamilies, and has not unnaturally fallen into the greatest misunderstanding as to their proper location. In these pages I have therefore sought to correct that part of his work, with Walker’s types before me in the British Museum. The Malayan species are dealt with in part iii. of my ‘*Rhynchota Malayana*’ (Records of the Indian Museum), and those from all other localities are recorded in this paper.

All the types of the species now described are contained in the British Museum.

Subfam. *ACANALOIINÆ*.

Genus *ACANALONIA*.

Acanalonia, Spin. Ann. Soc. Ent. Fr. (1) viii. p. 447 (1839).

Type, *A. servillei*, Spin.

Ann. & Mag. N. Hist. Ser. 8. Vol. v.

21

Acanalonia varipennis.

Pæcilopectera varipennis, Walk. List Hom., Suppl. p. 113 (1858).

Acanalonia varipennis Stål, Öfv. Vet.-Ak. Förh. 1862, p. 491.

Pæcilopectera viridissima, Walk. Ins. Saund., Hom. p. 54 (1858).

Cromma peracuta, Melich. (part.) Ann. Hofmus. Wien, xvii. p. 62 (1901).

Colgar peracuta, Kirk. (part.) Rep. Exp. Stat. Haw. Plant. Assoc. pt. ix. p. 458 (1906).

Hab. Amazons.

Walker correctly localized his *P. varipennis* as from Para, and *P. viridissima* as from "Tocant," an abbreviation for the well-known Tocantins River. This, however, has not prevented it being considered a synonym of the Australian species *C. peracuta*, by both Melichar and Kirkaldy.

Acanalonia laurifolia.

Pæcilopectera laurifolia, Walk. List Hom., Suppl. p. 117 (1858).

Acanalonia servillei, Melich. (part.) Ann. Hofmus. Wien, xvi. p. 186 (1901).

Hab. Amazons.

Dr. Melichar has treated this species as a synonym of *A. servillei*, from which, however, it differs in the transverse and much less anteriorly angulated vertex.

Acanalonia complanata.

Pæcilopectera complanata, Walk. List Hom. ii. p. 461 (1851); Melich. Ann. Hofmus. Wien, xvii. p. 227 (1903).

Hab. —?

Genus PARATHISCIA.

Parathiscia, Melich. Ann. Hofmus. Wien, xvi. p. 194 (1901).

Type, *P. conugata*, Melich.

Parathiscia truncatella.

Dalapax truncatella, Walk. List Hom., Suppl. p. 332 (1858).

Pseudoflata nigricornis, Melich. (part.) Ann. Hofmus. Wien, xvi. p. 251 (1901).

Hab. Natal.

I have figured this species in my 'Insecta Transvaaliensia,' pt. x. tab. xxiii. fig. 2.

Subfam. *FLATINÆ*.Genus *ITYRÆA*.*Ityræa*, Stål, Hèm. Afr. iv. p. 235 (1866).Type, *I. nigrocincta*, Walk.*Ityræa gregoryi*, sp. n.

Head dull reddish, antennæ black; pronotum and mesonotum sanguineous; abdomen above and body beneath pale ochraceous, thickly whitish tomentose; anterior and intermediate legs piceous or black, more or less greyish tomentose, posterior legs ochraceous, apices of tibiæ and the tarsi fuscous; tegmina ochraceous, narrowly carmine-red at base, costal, apical, and posterior claval margins narrowly piceous, at apex of clavus a piceous spot more or less linearly extending into corium; wings milky white; antennæ with the second joint more than twice the length of first; pro- and mesonota tricarinate; tegmina twice as long as broad.

Length, excl. tegm., ♂ ♀ 10 mm.; exp. tegm. 40–42 mm.

Hab. Brit. East Africa; Kibwezi River (*Gregory*).

A species allied to *I. nigrocincta*, Walk., from which it appears—judging from a series of six specimens—to constantly differ by the darker tegmina and the narrower structure of the same (twice as long as broad). It is also allied to *I. electa*, Melich., from the description of which it differs by the differently coloured margin of the tegmina.

This is one of the species illustrated in the frontispiece to Gregory's 'The Great Rift Valley,' but incorrectly coloured. It is, however, correctly portrayed in plate xxvi. Trans. Ent. Soc. Lond. (1902); the green insect in both plates is the *I. speciosa*, Melich.

Genus *PHROMNIA*.*Phromnia*, Stål, Rio Jan. Hem. ii. p. 68 (1858).Type, *P. pallida*, Oliv.*Phromnia pallida*.*Fulgora pallida*, Oliv. Enc. Méth. vi. p. 575. 42 (1791).*Phromnia pallida*, Stål, Hem. Afr. iv. p. 239 (1866) et syn.*Flata pallida*, Melich. Ann. Hofmus. Wien, xvi. p. 211 (1901).Var. *limbata*.*Cicada limbata*, Fabr. Ent. Syst. iv. p. 27. 3 (1794).*Phromnia pallida*, var. *limbata*, Stål, Hem. Afr. iv. p. 239 (1866) et syn.*Flata limbata*, Melich. Ann. Hofmus. Wien, xvi. p. 206 (1901).

Melichar has separated the forms *pallida* and *limbata* rather widely apart in his monograph of the genus (*supra*). I think, however, that Stål's view must be maintained, especially as the same variation occurs in the following Ethiopian species.

Hab. West and Central Africa.

Phromnia superba.

Flata superba, Melich. Ann. Hofmus, Wien, xvi. p. 206 (1901).

Var.—Tegmina pale tawny, not virescent, apical margin very narrowly black, costal margin obscurely reddish, posterior margin of clavus spotted with black and its lower base marked as in typical forms of the species.

Hab. Congo; Lutiti (*Dr. Christy*). Gold Coast (*Dr. Graham*), S. Nigeria (*Dr. Collett*), Bendi (*Dr. MacAlister*), Ashanti (*Dudgeon*, Brit. Mus.). Sierra Leone and Cameroons (*fide Melichar*).

Phromnia superba, Melich., could easily be recognized as a small form of *P. pallida*, Oliv.

Phromnia neavei, sp. n.

Body and legs virescent, abdomen sometimes completely greyish tomentose, anterior and intermediate tibiae and tarsi black; antennae black; tegmina virescent, costal and apical margins—to apex of clavus—somewhat broadly sanguineous, extreme apical margin fuscous or black; posterior margin of clavus black but not reaching base, where the margin is somewhat broadly ochraceous; wings creamy white, the extreme base virescent.

Var.—Tegmina ochraceous, not virescent.

Antennae with the second joint nearly half as long again as first; pro- and mesonota tricarinate; anterior and intermediate tibiae strongly sulcate, posterior tibiae with two spines.

Long., excl. tegm., ♂ 12, ♀ 13 mm.; exp. tegm., ♂ 38, ♀ 41 mm.

Hab. S.E. Congo Free State; W. of Kambove (*Neave*).

To be separated from *P. pallida* and *P. superba* by the black, not spotted posterior margin of the clavus and by the absence of the black basal spot from same.

Phromnia angolensis, sp. n.

Body pale ochraceous; antennae, anterior and intermediate tibiae and tarsi black; tegmina greenish ochraceous, costal

margin sanguineous, apical margin narrowly black; wings creamy white; antennæ with the second joint about half as long again as first; pro- and mesonota tricarinate; tegmina less than twice as long as broad.

Var.—Body and tegmina tawny ochraceous; tegmina with the costal margin obsoletely sanguineous, the apical margin narrowly black as in typical form.

Long., excl. tegm., 10 mm.; exp. tegm., ♀ 35–38 mm.

Hab. Angola (*Welwitsch*).

This species differs from *P. neavei* by its smaller size, and from it and the other African species by the unicolorous claval area and absence of black margin to same. The three specimens which have served for the above description were delivered to the British Museum by the executors of Dr. Welwitsch, as from the King of Portugal, in accordance with a decree of the High Court Judicature, November 1875.

Genus FLATINA.

Flatina, Melich. Ann. Hofmus. Wien, xvi. p. 214 (1901).

Type, *F. rubrotincta*, Hagl.

Flatina fimbriata.

Pæciloptera fimbriata, Walk. Ins. Saund., Hom. p. 54 (1858).

Phyllyphanta cornutipennis, Melich. (part.) Ann. Hofmus. Wien, xvii. p. 55 (1902).

Walker's type is from an unknown locality, but I possess a specimen received from Sierra Leone.

Flatina ornatula, sp. n.

Body and legs pale greyish; pro- and mesonota with two longitudinal pale sanguineous fasciæ, the margins of the latter more obscurely sanguineous; eyes and antennæ black, the latter palely tomentose; tegmina pale ochraceous grey, the costal, apical, and posterior claval margins narrowly dull reddish, three unbroken oblique fasciæ (not extending upwards beyond margin of costal membrane) and the clavus (excluding inner margin and basal area) pale sanguineous; wings creamy white; tegmina about one-third longer than broad; the claval area prominently granulate, first and second joints of antennæ subequal in length; pro- and mesonota longitudinally tricarinate.

Long., excl. tegm., $8\frac{1}{2}$ mm.; exp. tegm. 28 mm.

Hab. West Africa; Volta River (*Crowley Bequest*, Brit. Mus.).

Allied to *F. liciata*, Melich., from which it differs by the broader and unbroken sanguineous fasciæ to the tegmina, the more granulate clavus, &c.

Genus PARAFLATA.

Paraflata, Melich. Ann. Hofmus. Wien, xvi. p. 217 (1901).

Type, *P. seminigra*, Stål.

Paraflata kingdomi, sp. n.

Body and legs black; eyes, narrow anterior margin of pronotum, abdominal segmental margins, basal and apical margins to first joint of antennæ, coxal and other irregular sternal spots greyish white; tegmina pale ochraceous, less than basal half—truncate not sinuate externally—black; wings creamy white; antennæ robust, first and second joints subequal in length; pro- and mesonota somewhat crushed in typical specimen; tegmina not quite twice as long as broad, claval area finely granulate; posterior tibiæ with a single spine a little before apex.

Long., excl. tegm., ♀ 11 mm.; exp. tegm. 37 mm.

Hab. Madagascar; Antananarivo (*Kingdom*, Brit. Mus.).

Allied to *P. seminigra*, Stål, but differing by its larger size, different markings of the tegmina, the black basal area smaller and outwardly truncate, &c.

Genus CRYPTOFLATA.

Cryptoflata, Melich. Ann. Hofmus. Wien, xvii. p. 19 (1902).

Type, *C. unipunctata*, Oliv.

Cryptoflata guttularis.

Nephesa guttularis, Walk. Journ. Linn. Soc. Lond., Zool. i. p. 160 (1857).

Var. *punctipennis*, Walk., MS.

Tegmina pale virescent, spotted as in typical *guttularis*.
Assam; Margherita. N. China (Brit. Mus.).

Cryptoflata unipunctata.

Fulgora unipunctata, Oliv. Enc. Méth. vi. p. 576 (1791).

Colobesthes bigutta, Walk. List Hom. ii. p. 441 (1851).

Pæcilopectera sobrina, Stål, Öfv. Vet.-Ak. Förh. 1855, p. 191.

Cryptoflata unipunctata, Melich. Ann. Hofmus. Wien, xvii. p. 23 (1902).

Var. *areolifera*, Walk.*Pæciloptera areolifera*, Walk. List Hom., Suppl. p. 112 (1858).*Cryptoflata areolifera*, Melich. Ann. Hofmus. Wien, xvii. p. 24 (1902).*Hab.* West Africa, East Africa, Natal.*Cryptoflata hova*, sp. n.

Body and legs pale ochraceous with a virescent tint, probably more decidedly greenish in fresh specimens; tegmina sordidly greyish white, claval area somewhat thickly covered with dull reddish granules and some smaller scattered granules of the same colour on basal area of corium beneath the radial area; wings creamy white; vertex transverse, about twice as broad as long, centrally longitudinally carinate, the lateral margins also carinate, the apex truncate; face a little longer than broad, centrally longitudinally carinate, the carination only extending about halfway from base, lateral margins a little laminate; rostrum slightly passing the anterior coxæ; tegmina twice as long as broad, widened towards apex, apical margin subtruncate, posterior margin moderately concavely sinuate, costal membrane only slightly narrower than radial area, the apical marginal area wider at apex than at posterior angle; tibiæ sulcate.

Long., excl. tegm., ♀ 7 mm.; exp. tegm. 23 mm.

Hab. Central Madagascar (*Rev. Deans Cowan*, Brit. Mus.).

Genus MELICHARIA.

Melicharia, Kirk. Entomologist, xxxiii. p. 294 (1900).Type, *M. quadrata*, Kirby.*Melicharia doddi*, sp. n.

Head, pronotum, and mesonotum more or less olivaceous green, pro- and mesonota with a broad central longitudinal brownish fascia; abdomen above olivaceous green, thickly whitely tomentose; body beneath and legs pale virescent; tegmina pale green, with the veins more ochraceous, costal margin from about one-fourth from base, apical and inner margin to apex of clavus, and the apical two-thirds of claval vein sanguineous; in costal membrane beneath the costal margin are some minute sanguineous spots and a few more of rather paler colour in arched series on posterior disk of corium, base of costal margin ochraceous; wings creamy white; vertex much broader than long, anteriorly truncate,

centrally and laterally carinate, face obliquely broadened anteriorly, the anterior margin truncate, centrally longitudinally carinate throughout its whole length, the lateral margins broadly reflexed; tegmina twice as broad as long, apical margin subtruncate, the apical and posterior angles rounded, the inner margin angularly sinuate at apex of clavus, two transverse lines formed of transverse veins on apical area, the outermost moderately convex, enclosing a series of narrow longitudinal marginal cellular areas, the inner less well defined.

Long., excl. tegm., ♀ $4\frac{1}{2}$ mm.; exp. tegm. 14 mm.

Hab. Queensland; Kuranda (*F. P. Dodd*, Brit. Mus.).

In colour and pattern of tegmina, but not in shape or structure of head, somewhat resembling *Colgar peracuta*, Walk.

Melicharia unicolor.

Massila unicolor, Walk. Journ. Ent. i. p. 315 (1862); Melich. Ann. Hofmus. Wien, xvii. p. 159 (1902).

Hab. Moreton Bay.

Melicharia lurida.

Pæcilopectera lurida, Walk. Ins. Saund., Hom. p. 53 (1858); Melich. Ann. Hofmus. Wien, xvii. p. 229 (1902).

Hab. Gambia.

A single typical specimen in very bad condition.

Genus SIPHANTA.

Siphanta, Stål, Hem. Afr. iv. p. 238 (1866).

Type, *S. acuta*, Walk.

Siphanta atomaria.

Pæcilopectera atomaria, Walk. Ins. Saund., Hom. p. 56 (1858).

? *Colgar atomaria*, Melich. Ann. Hofmus. Wien, xvii. p. 117 (1902).

Neomelicharia ? *atomaria*, Kirk. Rep. Exp. Stat. Haw. Plant. Assoc. pt. ix. p. 453 (1906).

Hab. Tasmania.

Siphanta stigma, sp. n.

Head, pronotum, mesonotum, and abdomen above ochraceous, the latter greenish on basal area; body beneath and legs greenish ochraceous, tibiae (excluding basal areas) and the tarsi dull pale reddish; tegmina pale greenish ochraceous,

excluding clavus and costal membrane thickly finely spotted with greyish white, the veins darker and green in colour, a distinct small fuscous spot on central disk of apical area, the costal margin from about end of radial area, continued round apical margin to end of clavus, very finely spotted with dull reddish; wings creamy white; vertex subequal in length to that of pronotum, anteriorly subangularly rounded, the margins distinctly carinately elevated and narrowly reddish, two central converging carinate lines united anteriorly; pronotum rugulosely granulose; mesonotum tricarinate, obscurely granulose; tegmina about twice as long as broad, the costal margin rounded at basal area, apical margin subtruncate, the apical and posterior angles rounded; clavus somewhat coarsely granulose.

Long., excl. tegm., ♀ 6 mm.; exp. tegm. 17 mm.

Hab. Australia, *sic* (Brit. Mus.).

This species is unfortunately not precisely located, but is almost certainly from South-east Australia.

Siphanta sp.

Siphanta galeata, Kirk. Rep. Exp. Stat. Haw. Plant. Assoc. pt. ix. p. 453, pl. xxxii. fig. 11 (1906); id. Rep. Exp. Stat. Haw. Plant. Assoc., Bull. iii. p. 99, pl. v. fig. 3, and pl. vi. figs. 3 & 4 (1907).

Hab. Queensland.

The head and pronotum of this proposed species, as represented by the two figures given by Kirkaldy (1906 and 1907), are quite dissimilar, and cannot be taken to represent the same species. As neither of them has been disowned, *S. galeata* without an examination of the type (now at Honolulu) is outside present recognition.

In the above publication Kirkaldy has unfortunately increased his mystification of this genus by giving different references to figures for the same species. Thus both *S. acuta* and *S. breviceps* are referred (*supra*, 1907, p. 100) to pl. iii. fig. 2, but in the description of the plates the latter is referred to pl. v. fig. 2, while a comparison of the figures on the plates will show that more than one genus is represented. A glance at the venation of the species illustrated on plates iv. and v. (1907) will prove that contention*.

SIPHANTOIDES, gen. nov.

Vertex coarsely granulose, about as broad as long, as long as pronotum, subquadrate, anterior margin truncate, a little

* Since this was written we regret to have heard of the death of Mr. Kirkaldy at San Francisco.

rounded at the anterior angles; face longer than broad, flat, somewhat concavely depressed, basal margin a little rounded, lateral margins from clypeus to about one-third from base laminately reflexed; clypeus small, the margins broadly ridged; pronotum coarsely granulose, the lateral margins ridged, anterior margin truncate, posterior margin concave, the lateral margins obliquely rounded; mesonotum coarsely granulose, longer than pronotum, the disk raised and ridged at each lateral margin; legs of moderate length, tibiae sulcate, posterior tibiae not spined; tegmina about one and a half times longer than greatest breadth, twice as broad at apex as at base, strongly arched to apex, which is broadly rounded, apical margin obliquely truncate, its posterior angles angulate, but not or only very slightly posteriorly produced, the posterior margin angularly sinuate at apex of clavus, two strongly branched longitudinal veins arising from basal cell, costal membrane a little narrower than radial area, the first transversely, the latter reticulately veined, clavus coarsely granulose; wings about as broad as tegmina; two transverse veins before apical area.

Type, *S. conspicua*, Dist.

Siphantoides conspicua, sp. n.

Body and legs bright ochraceous, abdomen more or less greyishly tomentose, tibiae and tarsi more or less sanguineous; tegmina virescent, inclining to ochraceous, a large basal castaneous spot extending from claval vein to the second longitudinal vein emanating from basal cell, a waved oblique castaneous fascia irrorated with virescent spots extending upward from apex of clavus to about one-third from costal margin, apical margin extending to apex of clavus finely spotted with castaneous, the claval granules mostly red; wings milky white, with a slightly bluish reflection.

Long., excl. tegm., 8 mm.; exp. tegm. 22 mm.

Hab. Queensland; Townsville (*Dodd*, Brit. Mus.).

Siphantoides trimaculatus, sp. n.

Vertex, pronotum, and mesonotum bright orange-yellow; eyes castaneous; abdomen above greyishly tomentose, the margins of the segments palely virescent; body beneath and legs pale ochraceous, abdomen beneath greyish; anterior and intermediate tibiae more or less suffused with sanguineous; tegmina pale virescent, with three small dull reddish spots, one in clavus near base, one at apex of clavus, and the other on disk near middle, apical margin continued

to claval apex finely spotted with sanguineous; wings milky white, the veins virescent; vertex, pronotum, and mesonotum rugulosely granulose; vertex about as broad as long and as long as pronotum, the lateral margins of which are ridged; mesonotum longer than pronotum, the disk raised and ridged at each lateral margin; clavus coarsely granulose.

Long., excl. tegm., 7 mm.; exp. tegm. 20 mm.

Hab. Queensland (Dodd, Brit. Mus.).

Siphantoides alboconspersus, sp. n.

Vertex, pronotum, and mesonotum orange-yellow, abdomen above pale virescent; body beneath and legs pale ochraceous, apices of anterior and intermediate tibiae and tarsi slightly suffused with sanguineous, tegmina greyish virescent, with all the veins broadly ochraceous, thus producing the appearance of numerous pale spots, the apical margin continued to claval apex finely spotted with sanguineous; clavus coarsely granulose, the granules dull reddish; wings milky white, the veins pale virescent; vertex, pronotum, and mesonotum rugulosely granulose; vertex about as long as broad and as long as pronotum; mesonotum somewhat mutilated in typical specimen; anterior lateral margins of face distinctly dark ochraceous.

Long., excl. tegm., 7 mm.; exp. tegm. 17½ mm.

Hab. Queensland (Dodd, Brit. Mus.).

Genus COLGAR.

Colgar, Kirk. Entomologist, 1900, p. 242; id. *loc. cit.* 1903, p. 79.

Atella, Stål (part.), Hem. Afr. iv. p. 238 (1866); id. Berl. ent. Zeitschr. x. p. 394 (1866) (nom. preocc.).

Cromna, Melich. (part.) Ann. Hofmus. Wien, xvii. p. 58 (1902).

Type, *C. peracuta*, Walk.

Colgar roseipennis, sp. n.

Body and legs ochraceous or greenish ochraceous; apical area of vertex, basal area of face, apices of tibiae, tarsi, and anal abdominal appendage above more or less rosaceous; tegmina greyish, with the apical area and the whole of the venation rosaceous, two small spots on disk of corium and the apical margin darker and more roseate in hue; wings creamy white, with the basal longitudinal veins roseate; vertex upwardly and angularly produced, somewhat conical; face much longer than broad, narrowed at base, centrally longitudinally carinate; tegmina about twice as long as

broad, apical margin a little obliquely truncate; clavus prominently granulose, many of the granules roseate in hue.

Long., excl. tegm., $6\frac{1}{2}$ mm.; exp. tegm. 15 mm.

Hab. Queensland (*Dodd*, Brit. Mus.).

No special locality given by Mr. Dodd.

Colgar peracuta.

Cromna peracuta, Walk. List Hom., Suppl. p. 120 (1858); Melich. (part.) Ann. Hofmus. Wien, xvii. p. 62 (1902).

Colgar peracuta, Kirk. Entomologist, 1900, p. 242.

? *Euphanta rubromarginata*, Schmidt, Stett. ent. Zeit. 1904, p. 360.

Melichar (*supra*) has proposed some unfortunate synonymy respecting this species. The *Cromna nasalis*, Walk. (List Hom., Suppl. p. 120, 1858), which he includes, he has previously (*loc. cit.* p. 40) rightly placed as a synonym of *Euphanta munda*, Walk. *Pæcilopectera viridissima*, Walk., placed as another synonym, is a species of *Acanalonia*, = *A. varipennis*, Walk. Another species included by Melichar, *Flatoides simplex*, Walk. (Journ. Linn. Soc. Lond., Zool. x. p. 143, 1868), is not even a Flatid, but belongs to the Tropiduchinae and to the genus *Ficarasa*, Walk. *Pæcilopectera roseicincta*, Walk. (Journ. Ent. i. p. 313, 1862), another inclusion, belongs to the genus *Parasalurnis*, whilst *Nephesa grata*, Walk., which heads the synonymic list, can rightly be left in *Nephesa* where Walker placed it.

Colgar rufostigmata, sp. n.

Body and legs very pale virescent; abdomen above and body beneath more or less greyishly tomentose; tegmina very pale virescent, sometimes almost greyish white, the costal margin from end of costal membrane and the apical margin continued to apex of clavus very narrowly sanguineous (in some specimens the marginal coloration is obsolete), a prominent sanguineous spot near middle of tegmen, and a smaller spot of the same colour nearer base; wings milky white; vertex scarcely or only slightly longer than pronotum, finely centrally longitudinally carinate; face with the sublateral carinations reaching margin of clypeus; pronotum very indistinctly carinate; mesonotum faintly tricarinate; tegmina slightly less than twice as long as broad, their apical margins subtruncate, costal margin moderately arched at base; claval area subprominently granulose.

Long., excl. tegm., ♂ ♀ 7–8 mm.; exp. tegm. 19–20 mm.

Hab. Queensland; Townsville (*Dodd*, Brit. Mus.); Moreton Bay (Pascoe Coll., Brit. Mus.).

Colgar tricolor, sp. n.

Body and legs pale green; abdomen above and body beneath whitely tomentose; tegmina pale green, with numerous irregular whitish spots, beyond the middle some of these spots form more or less distinctly two oblique macular fasciæ, costal margin from end of costal membrane, and apical margin continued to claval apex, very narrowly sanguineous, three small sanguineous spots in longitudinal series on disk, the one nearest base usually smallest and somewhat indistinct; wings creamy white, the veins more or less pale bluish green; vertex finely sparingly granulose, anteriorly moderately upturned, a little longer than the pronotum, strongly centrally longitudinally carinate; pronotum very sparingly granulose, centrally carinate, the lateral margins also carinate; mesonotum tricarinate; tegmina about twice as long as broad, moderately arched at base, the apical margin truncately oblique; claval area strongly granulose.

In some specimens the apical area of the tegmina is somewhat suffused with pale reddish ochraceous and the carinations to the face are more or less sanguineous.

Long., excl. tegm., ♂ ♀ 7-7½ mm.; exp. tegm. 19-20 mm.

Hab. Queensland; Kuranda (*Dodd*, Brit. Mus.).

PARASALURNIS, gen. nov.

Vertex a little angularly produced, centrally longitudinally impressed; face somewhat convex, a little longer than broad, strongly centrally longitudinally ridged, the basal and lateral margins ridged, the latter also laminately reflexed; pronotum as long as or longer than vertex, granulose, more or less centrally longitudinally depressed, strongly sublaterally carinate on each side; mesonotum tricarinate; tegmina less than twice as long as broad, costal margin a little rounded, apical margin subtruncate, the apical and posterior angles rounded, inner margin concavely sinuate, claval area strongly granulose, corium with a network of numerous transverse veins, thus resembling the genus *Salurnis*.

Type, *P. roseicincta*, Walk.

Parasalurnis roseicincta.

Pæciloptera roseicincta, Walk. Journ. Ent. i. p. 313 (1862).

Cromma peracuta, Melich. (part.) Ann. Hofmus. Wien, xvii. p. 62 (1902).

? *Siphanta rubra*, Schmidt, Stett. ent. Zeit. lxx. p. 358 (1904).

Hab. Australia; Moreton Bay (Brit. Mus.).

Parasalurnis insularis, sp. n.

Vertex sanguineous, more or less ochraceous at base; face and clypeus ochraceous, the lateral margins of the first more or less sanguineous and with two small brownish spots before clypeus, which has two linear brownish spots separated by a central pale slightly carinate line; pro- and mesonota bright ochraceous; abdomen above ochraceous, the base suffused with blackish; body beneath and legs ochraceous, the latter with their upper surfaces carmine-red; tegmina bright ochraceous, a little paler between the numerous transverse veins, giving the appearance of pale greyish spots, costal margin to about end of radial area very narrowly carmine-red, thence round apex, along apical margin to end of clavus closely marked with small carmine-red spots, claval vein similarly spotted; wings creamy white; vertex a little subangularly produced, centrally longitudinally impressed; face with the lateral margins slightly convex, strongly centrally longitudinally ridged, the lateral margins ridged and laminately reflexed; pronotum granulose; mesonotum granulose on anterior area, tricarinate; tegmina less than twice as long as broad, with the claval area strongly granulose.

Long., excl. tegm., 5 mm.; exp. tegm. 16 mm.

Hab. N.W. Australia; Baudin Island (*J. J. Walker*, Cruise of H.M.S. 'Penguin'; Brit. Mus.).

Parasalurnis infumata, sp. n.

Body and legs pale greenish yellow; anterior margin of vertex, basal margin of face, and the tibiae and tarsi more or less dull reddish; tegmina pale green, the areas enclosed by the numerous transverse veins paler in hue and giving the appearance of obscure greyish spots, costal and apical margins to end of clavus spotted with dull reddish, a few small scattered red spots on disk, claval granules piceous, and a large broad irregular longitudinal fascia, occupying clavus for about one-third its length, then broadened and extended upward on corium and obliquely continued to posterior angle, umber-brown; wings creamy white; vertex about or almost as long as pronotum, anteriorly subangulate, medially impressed; face longer than broad, strongly centrally longitudinally ridged, the lateral margins ridged and laminately reflexed; tegmina less than twice as long as broad, strongly arched at base, apical margin truncately rounded, inner margin sinuate at apex of clavus.

Long., excl. tegm., 7 mm.; exp. tegm. 19 mm.

Hab. Queensland; Townsville (*Dodd*, Brit. Mus.).

NEOSALURNIS, gen. nov.

Head (including eyes) a little narrower than pronotum, vertex about as long as pronotum, somewhat broadly, angularly, and a little upwardly produced; face longer than broad, a little posteriorly and more strongly anteriorly narrowed, the lateral margins from a little in front of eyes to clypeus broadly laminately ridged, at base with a very short central carination; clypeus shorter than face, obscurely obliquely striate on each side; pronotum with a central longitudinal ridge; mesonotum tricarinate; legs of moderate length, tibiae sulcate, posterior tibiae with one spine near apex; tegmina less than twice as long as broad, the costal margin moderately convex, the apex rounded, the apical margin obliquely truncate, its posterior angle more or less acutely produced, costal membrane narrower than radial area, the first transversely veined, the latter reticulately veined, the whole corium transversely reticulately veined, and a series of longitudinal marginal cells more or less continuous with the costal membrane extending round apex and along apical margin, clavus coarsely granulose; wings about as broad as tegmina, two transverse veins before apical area.

This genus is allied to *Salurnis*, Stål, from which it principally differs by the venation of the tegmina, and by the costal and apical marginal series of short longitudinal cells.

Neosalurnis reticulatus, sp. n.

Head, pronotum, mesonotum, sternum, legs, abdomen beneath, and tegmina greenish ochraceous, abdomen above slightly greyishly tomentose; wings milky white, the veins greenish; apical and sutural margin (beyond clavus) of tegmina finely spotted with fuscous brown, posterior margin of clavus more or less fuscous brown; tegmina with all the veins distinctly prominent and a little darker in coloration; other structural characters as in generic diagnosis.

Long., excl. tegm., 8 mm.; exp. tegm. 24 mm.

Hab. Bhutan (Brit. Mus.). Burma; Karen Hills (*Doherty*, Coll. Dist.).

GERALDTONIA, gen. nov.

Vertex as long as or slightly longer than pronotum, almost as broad as long, the lateral margins parallel and ridged, notched before apex and then apically, angularly convexly rounded, a little deflected on each side and strongly centrally longitudinally ridged; face longer than broad, wider posteriorly

than at base, which is rounded, the lateral margins notched before base and again behind middle, a very short prominent longitudinal central ridge at base, and an obscure oblique ridge on each side, commencing at anterior notch and obliquely, inwardly directed towards clypeus, the lateral margins laminately reflexed; pronotum tricarinate, anterior margin convex, basal margin concave; mesonotum much longer than pronotum, tricarinate; legs of moderate size, the tibiae sulcate, posterior tibiae with a distinct spine before apex; tegmina about twice as long as broad, apically widened, costal margin strongly arched at base, moderately deflected towards apex, which is rounded, apical margin truncate, its posterior angles strongly, angularly backwardly produced, costal membrane narrower than radial area, clavus with transverse veins above claval vein, beneath this vein strongly granulose, three strongly branching longitudinal veins from upper end of cell; wings broad, two transverse veins before apical area.

Allied to *Scarpantina*, Melich., but differing strongly in the structure of the vertex.

Geraldtonia protea, sp. n.

Body above virescent or greenish ochraceous; vertex, pronotum, and mesonotum more or less centrally purplish brown; abdomen above greyishly tomentose; body beneath and legs dull ochraceous; lateral and basal margins of face usually narrowly sanguineous, and the short central longitudinal basal ridge of that colour; tegmina bright virescent, with numerous scattered small dull reddish spots, a more prominent and more piceous spot beneath the radial vein near base, on disk above apical area of clavus a large and small white spot, divided from each other and margined with dull reddish, granules to clavus reddish and claval posterior margin from a short distance from base piceous brown, beyond clavus the sutural margin spotted with castaneous; wings milky white, veins with a slight virescent tint.

Var. a.—The large white spot to tegmina divided into a cluster of some twelve unequal parts by dull reddish lines, outwardly margined with dull reddish as in typical form.

Var. b.—The large white spot as in *var. a* now totally dull reddish.

Long., excl. tegm., 9–10 mm.; exp. tegm. 26 mm.

Hab. Queensland (*Dodd*, Brit. Mus.); Geraldton, near Cairns (*Meek*, Brit. Mus.).

Geraldtonia uniformis, sp. n.

Head, pronotum, and mesonotum virescent or greenish ochraceous and more or less centrally suffused with purplish brown; abdomen above greyishly tomentose; body beneath and legs pale ochraceous; lateral and basal margins of face narrowly sanguineous and the short central basal carination of that colour; tegmina pale ochraceous, with numerous small scattered dull reddish spots, across disk before apical area a narrow oblique pale fascia containing a series of the dull reddish spots and outwardly margined with pale reddish, granules in clavus mostly dull red, the claval posterior margin at a short distance from base purplish brown, the sutural margin beyond clavus spotted with castaneous; wings milky white, the veins faintly pale virescent.

Var. a.—Tegmina virescent, the pale oblique fascia not outwardly margined with reddish.

Long., excl. tegm., 10 mm.; exp. tegm. 30 mm.

Hab. Queensland (*Dodd*, Brit. Mus.); Geraldton, near Cairns (*Meek*, Brit. Mus.).

GENUS ORMENIS*.

Ormenis, Stål, Rio Jan. Hem. p. 68 (1862).

Type, *O. perfecta*, Walk.

Ormenis perfecta.

Pæcilopectera perfecta, Walk. List Hom. ii. p. 449 (1851); Stål, Öfv. Vet.-Akad. Förh. 1862, p. 489.

Pæcilopectera rufo-terminata, Stål, Rio Jan. Hem. ii. p. 11 (1861).

Ormenis testacea, Melich. (part.) Ann. Hofmus. Wien, xvii. p. 80 (1902).

Hab. Jamaica, Brazil.

Ormenis testacea.

Pæcilopectera testacea, Walk. List Hom. ii. p. 456 (1851).

Pæcilopectera varicosa, Walk. Ins. Saund., Hom. p. 53 (1858).

Ormenis testacea, Melich. (part.) Ann. Hofmus. Wien, xvii. p. 80 (1902).

Hab. Amazons.

* The large number of species included at present in *Ormenis* will probably at some future time receive generic subdivision.

*Ormenis primaria.**Pæciloptera primaria*, Walk. List Hom., Suppl. p. 334 (1858).*Ormenis testacea*, Melich. (part.) Ann. Hofmus. Wien, xvii. p. 80 (1902).*Hab.* Rio Janeiro.*Ormenis intricata.**Pæciloptera intricata*, Walk. Ins. Saund., Hom. p. 52 (1858).*Hab.* Brazil.*Ormenis discus.**Flatoides discus*, Walk. List Hom. ii. p. 409 (1851).*Ormenis discus*, Stål, Öfv. Vet.-Ak. Förh. 1862, p. 490; Melich. Ann. Hofmus. Wien, xvii. p. 75 (1902).*Flatoides latistriga*, Walk. Ins. Saund., Hom. p. 48 (1858).*Ormenis latistriga*, Melich. Ann. Hofmus. Wien, xvii. p. 98 (1902).*Hab.* Amazons.*Ormenis perpusilla.**Pæciloptera perpusilla*, Walk. List Hom. ii. p. 467 (1851).*Ormenis perpusilla*, Melich. (part.) Ann. Hofmus. Wien, xvii. p. 90 (1902).*Ormenis tortricina*, Melich. (part.) *loc. cit.* p. 81.

The unique type of *O. perpusilla*, Walk., is in bad condition, headless and probably discoloured. It is therefore not clear why Melichar should have placed the *Ormenis inferior*, Fowl, as a synonym of it, particularly as he had previously placed this same *O. inferior* as a synonym of *O. tortricina*, Germ.

Genus CYARDA.

Cyarda, Walk. List Hom., Suppl. p. 121 (1858).Type, *C. difformis*, Walk.*Cyarda difformis.**Cyarda difformis*, Walk. List Hom., Suppl. p. 121 (1858).*Pæciloptera iniquipennis*, Walk. Ins. Saund., Hom. p. 107 (1858).*Cyarda acuminipennis*, Melich. (part.) Ann. Hofmus. Wien, xvii. p. 134 (1902).*Hab.* St. Domingo.

Genus COLPOPTERA.

Colpoptera, Burm. Handb. Ent. ii. p. 155 (1839).Type, *C. sinuata*, Burm.

The proper position of this genus is difficult to locate. Stål seemed to have placed it between the Issinæ and Ricaniinæ, Fowler in the Issinæ, Melichar and Van Duzée in the Ricaniinæ. It is probable that its natural position is in the Flatinæ near *Cyarda*, Walk., though the scarcely perceptible granules to the claval area renders this decision a tentative one only.

Colpoptera elevans.

Pæcilopectera elevans, Walk. List Hom., Suppl. p. 335 (1858).

Ormenis elevans, Melich. Ann. Hofmus. Wien, xvii. p. 71 (1902).

Colpoptera rugosa, Van Duz. Bull. Buff. Soc. Nat. Sci. viii. p. 36 (1907).

Hab. Jamaica.

Genus SELIZA.

Seliza, Stål, Berl. ent. Zeitschr. iv. p. 312 (1862).

Type, *S. vidua*, Stål.

Seliza? *lignarius*.

Flatoides lignarius, Walk. List Hom. ii. p. 413 (1851).

Pæcilopectera punctifrons, Walk. loc. cit., Suppl. p. 118 (1858).

Seliza ferruginea, Melich. (part.) Ann. Hofmus. Wien, xvii. p. 138 (1902).

Hab. China.

Seliza immunis.

Pæcilopectera immunis, Walk. Ins. Saund., Hom. p. 107 (1858).

Ormenis? *immunis*, Melich. Ann. Hofmus. Wien, xvii. p. 98 (1902).

Hab. — ?

Genus ANAYA.

Anaya, Dist. Faun. B. I., Rhynch. iii. p. 447 (1906).

Type, *A. mesochlora*, Walk.

Anaya pustulata.

Flatoides pustulatus, Walk. Ins. Saund., Hom. p. 48 (1858).

Ormenis mesochlorus, Melich. (part.) Ann. Hofmus. Wien, xvii. p. 99 (1902).

Anaya mesochlora, Dist. (part.) Faun. B. I., Rhynch. iii. p. 447 (1906).

Hab. — ?

I had followed Melichar in considering the *F. pustulatus*, Walk., as a synonym of *F. mesochlorus*, Walk., but now that I have been able to find and examine the type of the first

mentioned species it is evident that it is altogether distinct, though unfortunately unlocalized.

Anaya nicobarensis, sp. n.

Body and legs brownish ochraceous; lateral spots to abdomen above, vertex, and face chocolate-brown; tegmina brownish ochraceous, the apical margin paler, about basal half of costal membrane and radial area jet-black, clavus piceous, a central discal white patch on which are three somewhat large black spots, and beyond this white patch a cluster of more irregular and smaller black spots; wings pale fuliginous, with greyish-white streaks between the veins on basal area; vertex transverse, centrally ridged and laterally carinate; face about as broad as long, centrally ridged, laterally broadly laminately ridged; tegmina with the costal margin arched at base, the apical margin truncate; costal membrane a little wider than radial area; clavus somewhat strongly granulose.

Long., excl. tegm., $6\frac{1}{2}$ mm.; exp. tegm. 17 mm.

Hab. Nicobar Islands; Narcondam (*G. Rogers*, Brit. Mus.).

Gen. ? *basalis*.

Flatoides basalis, Walk. List Hom. ii. p. 419 (1851); Melich. Ann. Hofmus. Wien, xvii. p. 228 (1902).

This species apparently represents a new genus near *Anaya*. The condition of the unique unlocalized type, however, scarcely warrants generic description.

Genus CYPHOPTERUM.

Cyphopterum, Amyot. Ann. Soc. Ent. Fr. (2) v. p. 176 (1847); Melich. Ann. Mus. Nat. Hung. iii. p. 475 (1905).

Cyphopterum retusum.

Issus retusus, Walk. List Hom. ii. p. 371 (1851).

Cyphopterum retusum, Melich. Ann. Mus. Nat. Hung. iii. p. 477 (1905).

Hysteropterum curvipenne, Walk. Ins. Saund., Hom. p. 45 (1858).

The species described by Walker as *Hysteropterum curvipenne* is located as from "Port Philip." This is evidently incorrect, as it is an undoubted synonym of *C. retusum*.

The British Museum possesses a long series collected by Mr. Wollaston at the Cape Verde Islands, besides specimens from Madcira.

Genus HYPHANCYLUS.

Hyphancylus, Fowl. Biol. Centr.-Am., Rhynch. Hom. i. p. 117 (1904);
Melich. Mon. Issid. p. 114 (1906).

Type, *H. falcatus*, Fowl.

Owing to the granulate clavus this genus seems better located in the Flatinæ than in the Issinæ, where it was originally placed. It can be located near *Cyphopterum*, Amyot.

Genus MASSILA.

Massila, Walk. Journ. Entom. i. p. 314 (1862).

Type, *M. sicca*, Walk.

Massila ptyeloides.

Dechitus? *ptyeloides*, Walk. Journ. Entom. i. p. 311 (1862); Melich.
Mon. Ricaniid. p. 341 (1898).

Hab. Moreton Bay.

Closely allied to *M. sicca*, Walk.

Genus UXANTIS.

Uxantis, Stål, Öfv. Vet.-Ak. Förh. 1870, p. 775.

Type, *U. consputa*, Stål.

Uxantis notata, sp. n.

Vertex, pronotum, and mesonotum very pale virescent, abdomen above more distinctly greenish; vertex with three black spots, one at each basal angle, the other at apex; pronotum sparingly coarsely blackly punctate; mesonotum with sublateral black fasciæ, which are furcate anteriorly; body beneath and legs very pale virescent; basal margin and basal halves of lateral margins narrowly pale testaceous (this marginal coloration is absent in some specimens); tegmina pale greyish, opaque, the numerous veins and veinlets testaceous or fuscous brown, a series of small marginal piceous spots on posterior margin from apex of clavus, and these spots in smaller size, less distinct appearance, and less closely situate are continued round apical and along costal margins; wings creamy white, the veins more or less virescent; vertex broader than long, moderately concave, anteriorly transversely angulate, the margins ridged; face slightly longer than broad, the lateral margins ridged; tegmina about two and a half times as long as broad, the costal margin a little waved, widest at

base, moderately attenuated at apex, which is rounded, distinctly arched at base of costal margin.

Long., excl. tegm., ♂ ♀ 7-8 mm.; exp. tegm. 24-27 mm.

Hab. Queensland (*F. P. Dodd*, Brit. Mus.).

GENUS ATRACIS.

Atracis, Stål, Hem. Afr. iv. p. 250 (1866).

Type, *A. pyralis*, Guér.

Atracis basistigma.

Elidiptera basistigma, Walk. List Hom., Suppl. p. 69 (1858).

Atracis humeralis, Melich. (part.) Ann. Hofmus. Wien, xvii. p. 187 (1902).

Flatoïdes humeralis, Fowl. (part.) Biol. Centr.-Am., Rhynch. Hom. i. p. 60 (1900).

Flatoïdes basistigma, Fowl. loc. cit. p. 61.

Hab. Mexico.

Atracis humeralis.

Elidiptera humeralis, Walk. List Hom., Suppl. p. 70 (1858).

Flatoïdes humeralis, Fowl. (nec Walk.) Biol. Centr.-Am., Rhynch. Hom. i. p. 60 (1900).

Atracis humeralis, Melich. (nec Walk.) Ann. Hofmus. Wien, xvii. p. 187 (1902).

Hab. Central America, Amazons.

Both Fowler and Melichar have confused the references of this species by citing the *Flatoïdes humeralis*, Walk. (List Hom. ii. p. 405, 1851), which is a Ricaniid, and, as correctly given by Melichar previously (Mon. Ricaniid. p. 297, 1898), *Vutina atrata*, Fabr.

GENUS UYSANUS.

Uysanus, Dist. Ins. Transvaal. p. 205 (1908).

Type, *U. fluctuans*, Dist.

Uysanus nebulosa.

Atracis nebulosa, Melich. Ann. Hofmus. Wien, xvii. p. 180, t. ix. fig. 11 (1902).

Hab. Cameroons.

GENUS FLATOIDES.

Flatoïdes, Guér, Règn. Anim., Ins. p. 362 (1838)

Type, *F. tortrix*, Guér.

*Flatoides occidentis.**Elidiptera occidentis*, Walk. List Hom. ii. p. 331 (1851).*Cyarda occidentis*, Stål, Öfv. Vet.-Ak. Förh. 1862, p. 490.*Flatoides isabellinus*, Fowl. Biol. Centr.-Amer., Rhynch. Hom. p. 63, t. viii. fig. 5 a (1900).*Hab.* Central America.*Flatoides debilis.**Elidiptera debilis*, Walk. List Hom., Suppl. p. 72 (1858).*Cyarda debilis*, Stål, Öfv. Vet.-Ak. Förh. 1862, p. 490.*Cyarda acuminipennis*, Melich. (part.) Ann. Hofmus. Wien, xvii. p. 134 (1902).*Hab.* Amazons.

It is apparent that some of the notes taken by Stål during his visit to the British Museum in 1862 must have become transposed, or he would have been unlikely to place this species in the very distinct *Cyarda*, Walk.

*Flatoides dorsisigna.**Elidiptera dorsisigna*, Walk. List Hom., Suppl. p. 72 (1858).*Dascalidia dorsisigna*, Melich. Ann. Hofmus. Wien, xvii. p. 154 (1902).*Hab.* Amazons.*Flatoides punctata.**Elidiptera punctata*, Walk. List Hom. ii. p. 332 (1851).*Cyarda punctata*, Stål, Öfv. Vet.-Ak. Förh. 1862, p. 490; Melich. (part.) Ann. Hofmus. Wien, xvii. p. 135 (1902).*Hab.* "North America."

The figure given by Melichar as *punctata*, Walk. (*supra*, t. vii. fig. 17), represents a true *Cyarda*, but not Walker's species nor either of the two others he has placed as synonymic with it.

*Flatoides guianæ.**Elidiptera guianæ*, Walk. List Hom. ii. p. 333 (1851).*Cyarda guyanæ*, Stål, Öfv. Vet.-Ak. Förh. 1862, p. 490.*Cyarda punctata*, Melich. (part.) Ann. Hofmus. Wien, xvii. p. 135 (1902).*Hab.* British Guiana.

This species has considerable resemblance to *F. punctata*, Walk., but the head of the unique type is mutilated, and therefore it must at least be kept separate for the present.

Flatoides conformis.

Flatoides conformis, Walk. List Hom. ii. p. 412 (1851).

Cyarda conformis, Stål, Öfv. Vet.-Ak. Förh. 1862, p. 490; Melich. Ann. Hofmus. Wien, xvii. p. 134 (1902).

Hab. Jamaica.

Flatoides cervinus.

Flatoides cervinus, Walk. List Hom. ii. p. 412 (1851).

Cyarda cervinus, Stål, Öfv. Vet.-Ak. Förh. 1862, p. 490.

Cyarda acuminipennis, Melich. (part., nec fig.) Ann. Hofmus. Wien, xvii. p. 134 (1902).

Elidiptera punctifera, Walk. List Hom., Suppl. p. 71 (1858).

Cyarda punctifera, Stål, Öfv. Vet.-Ak. Förh. 1862, p. 490.

Cyarda punctata, Melich. (part., nec fig.) Ann. Hofmus. Wien, xvii. p. 135 (1902).

Hab. Jamaica, St. Domingo.

Flatoides alba.

Elidiptera alba, Walk. Journ. Ent. i. p. 307 (1862).

Hab. Rio Janeiro.

Unique type in too mutilated a condition for generic identification.

——? *incerta.*

Pæcilopectera incerta, Walk. List Hom. ii. p. 462 (1851).

Ormenis incerta, Melich. Ann. Hofmus. Wien, xvii. p. 98 (1902).

Hab. ——?

Melichar only copies Walker's description, and had not seen the species.

Species described by Walker in the Flatinae, but not belonging to that subfamily.

Subfam. *CIXIINÆ.*

—— *constellaris.*

Pæcilopectera constellaris, Walk. List Hom., Suppl. p. 335 (1858); Melich. Ann. Hofmus. Wien, xvii. p. 226 (1902).

Hab. Amazons.

The unique specimen representing this species has the head mutilated, which renders exact generic identification impossible. It probably represents a genus allied to *Paulia*, Stål.

Subfam. *TROPIDUCHINÆ*.— *docilis*.

Elidiptera docilis, Walk. List Hom., Suppl. p. 71 (1858).

Hab. Rio Janeiro.

Subfam. *LOPHOPINÆ*.Genus *ELASMOSCELIS*.

Elasmoscelis, Spin. Ann. Soc. Ent. Fr. viii. p. 388 (1859).

Type, *E. cimicoides*, Spin.

Elasmoscelis decoru.

Flatoides decorus, Walk. List Hom. ii. p. 418 (1851); Melich. Ann. Hofmus. Wien, xvii. p. 228 (1902).

Hab. — ?

The type is without locality. It is allied to *E. trimaculata*, Walk.

Subfam. *ISSINÆ*.*Trienopa rufescens*.

Elidiptera rufescens, Walk. List Hom. ii. p. 334 (1851).

Eriphyle rufescens, Stål, Öfv. Vet.-Ak. Förh. 1862, p. 490.

Hab. Sierra Leone.

This species seems to have been missed by Dr. Melichar in his 'Monogr. der Issiden.'

Gen. ? *limitata*.

Elidiptera finlivata, Walk. List Hom. ii. p. 329 (1851) (nom. misprint.).

Elidiptera limitata, Walk. loc. cit., Suppl. p. 68 (1858) (nom. nov.).

Pterilia limitata, Stål, Öfv. Vet.-Ak. Förh. 1862, p. 490.

This species belongs to a genus very near *Pterilia*, but the type specimen is not in a very satisfactory condition.

Fam. *JASSIDÆ*.Subfam. *LEDRIINÆ*.

Pæcilopectera solita, Walk. List Hom. ii. p. 467 (1851).

The type of this species is in a most mutilated condition, nevertheless the structure of the head shows its proper

position in the *Ledrinæ*. Stål evidently must have wrongly incorporated a note when he placed this species (*Hem. Afr.* iv. p. 246) as a synonym of his *Phlebopterum præmorsum*, which he figured (*Öfv. Vet.-Ak. Förh.* 1856, p. 67, pl. i. fig. 8). Melichar has copied the error (*Ann. Hofmus. Wien*, xvii. p. 2, 1902).

XLIV.—*The Collections of William John Burchell, D.C.L., in the Hope Department, Oxford University Museum.*

- IV. *On the Lepidoptera Rhopalocera collected by W. J. Burchell in Brazil, 1825-1830.* By E. G. JOSEPH, of Lincoln College, Oxford.

[Continued from ser. 8, vol. iii. p. 111.]

VII. *HELICONIINÆ.*

MR. J. C. MOULTON having left England in order to undertake the curatorship of the Sarawak Museum, I suggested to Mr. E. G. Joseph, of Lincoln College, Oxford, the preparation of an account of further groups of Burchell's Brazilian butterflies. To this Mr. Joseph readily assented, and, in the course of the work, I have had abundant opportunities of witnessing the great patience with which he has performed this laborious task and his success in doing justice to the wonderful accuracy and powers of observation of the illustrious naturalist.

E. B. POULTON.

The following paper forms the continuation of the valuable publications of Mr. J. C. Moulton on Burchell's Brazilian *Nymphaliniæ* and of Miss Cora B. Sanders on the earlier subfamilies.

In the nomenclature and succession of the species of *Heliconiiniæ* I have followed Stichel's monograph in Wytsman's 'Genera Insectorum'¹, and have only departed from his arrangement by splitting up *Heliconius nanna* into two subspecies.

The whole of the *Heliconiiniæ* in the Hope Department have been worked out and arranged, according to Stichel's monograph, by Mr. W. J. Kaye, F.E.S. I owe a deep debt

¹ 37th Fascicule of the 'Genera Insectorum,' edited by P. Wytsman. *Lepidoptera, Rhopalocera*; Fam. *Nymphalidæ*, Subfam. *Heliconiiniæ*, 1906.

of gratitude to this distinguished authority on the group, not only for the specific determinations, many of which are of great difficulty, but also for kind help and advice on special points which arose in the course of the work.

The arrangement of numbers and dates is explained in detail in *Ann. & Mag. Nat. Hist.* ser. 7, vol. xiii. (April 1904), pp. 309, 310. A further explanatory statement is quoted from ser. 8, vol. i. p. 34:—"Notes, other than numbers and dates, written on labels attached to the specimens are placed between inverted commas immediately after the numbers in heavy type, and immediately before the locality." "When a specimen bears a number only, the date, recovered from Burchell's note-book, is placed between square brackets. 'a.' and 'p.' associated with the date stand for 'A.M.' and 'P.M.'"

The geographical data and notes as to the character of certain localities are in many cases more complete and detailed in the following paper than in any of the preceding. This is a result of the study of the earlier manuscript volumes of Burchell's *Catalogue of Brazilian Plants*, containing the numbers 701-5336. Quotations from this source are distinguished by a terminal asterisk, thus *. About half of the catalogue of Brazilian plants has thus been studied and the data copied, viz. from April 2nd, 1825, when Burchell set foot in Portugal on his way to Brazil, up to August 23rd, 1827, when he was near the Rio Pardo on the journey from S. Paulo to Goyaz. These volumes, now in the library at Kew, have been kindly lent to Professor Poulton, at first by Sir William Thiselton Dyer, F.R.S., and later by Colonel D. Prain, F.R.S. Professor Poulton hopes that the whole of the data from this source will be transcribed at no distant date and made available for future papers.

Professor Westwood's labels, whenever they have been found attached to the specimens, are quoted in full. The words "a Westwood's label" of course always imply that he was the writer. "Westwood's list," on the other hand, is the list prepared under his direction, and, in the great majority of groups, written by an assistant. The condition of this list, as regards the subfamily now under consideration, is set forth in the two following paragraphs.

Burchell's species of the genus *Heliconius*, together with a single *Eueides*, were included by Westwood in his list of "Heliconiæ," described as follows in *Ann. & Mag. Nat. Hist.* ser. 7, vol. xiii., April 1904, p. 306:—"The first section of the butterflies is written in Professor Westwood's own handwriting, and deals with the Heliconiidæ in the old

broad sense, comprising the Ithomiinæ, the genera *Lycorea* and *Ituna* of the Danainæ, and the Heliconiinæ. Although in the form of rough notes and very difficult to disentangle, it is a model of accuracy. It records the whole of Burchell's notes written on the labels accompanying the specimens, but apparently none of the facts to be found in his manuscript note-books." Numbers are not assigned to the species, as they are in the lists written by an assistant. Westwood's brief accurate descriptions seize upon the characteristic points and frequently enable us to identify the individual specimens. Good examples of this are to be found in 1296-1300.

With the single exception of *Eueides tales pythagoras*, the species of the Heliconiine genus *Eueides* are included in Westwood's list of "Burchell's *Acræa* &c." The numbers and data in this list are written in a clerk's handwriting, the names or notes being inserted by Westwood himself. The data of *Eueides aliphera aliphera* and *E. lybia lybia*—the former very imperfectly copied into the above list—were also completely recorded by Westwood on a separate slip of paper. In the case of *E. tales pythagoras* Westwood was evidently at first misled by the mimetic resemblance, for he separated this species from its genus and placed it beside the *Heliconius* models in the list of "Heliconidæ." He ultimately recognized its true relationship and added the correct name.

E. G. JOSEPH.

Oxford, Dec. 4, 1909.

HELICONIINÆ.

1. Genus. HELICONIUS, Linné.

Section I. OPISOGYMNÆ.

Cohort i. SILVANIFORMES.

Heliconius narcæa narcæa, Godt.

Bz. 580. I. [21. 10. 25]. = 1284. Minas Geraes. "*Papilio*]. In a rossa at Discoberto, and along a channel (on the margin of the forest) which conducts water to the house." Burchell's manuscript catalogue of Brazilian plants records that he collected botanical specimens "on an Excursion into the Province of Minas Geræes, between 7th October 1825, and 15 Nov^r 1825." This Catalogue, which exists in the Kew library, will be hereafter quoted as "Cat. pl. Braz. MSS.," while passages extracted from it will be indicated by an asterisk, thus *.

29. 10. 25. = 1285. Minas Geraes. "In the forest on the

S.E. side of S. João de Nêpomucéna." Burchell's Cat. pl. Braz. MSS. gives the following general account of his travels between Oct. 27 and Nov. 14, 1825:—"In the Province of Minas Geráës on the Road between Porto d'Estrélla & the Descobérto do Rio Novo. From 27 October to 14 November 1825."*

According to Westwood's labels on **1290** and also according to his list, the date 29. 10. 25 was borne by an example of "*Hel. Eucrate* V[ar]"¹. The Burchell specimen **1285**, which now bears this date, agrees, however, in every particular with individuals identified by Westwood as belonging to the type form of the species. It is probable, considering the remarkable accuracy of this distinguished naturalist, that labels have been accidentally displaced, and that **1285** originally bore the date 30. 10. 25, shown by Westwood's list as well as by his label on **1287** to have been attached to an example of the type form. The transpositions which may have occurred are suggested under **1294**.

7. 11. 25. = **1286**. Minas Geraes. "Between [Captain] Amaro Leite's and Pillão, a fazenda"*. (See **1285**.) On Nov. 6th, at Capt. Leite's, Burchell noted, "The Comet clear and tail long"*; and at Pillão, on the following night, "The Comet very bright"*.

Professor H. H. Turner, F.R.S., kindly informs me that the comet referred to was "probably that denoted 1825 iv, discovered by Biela on July 19, 1825, and by Pons on July 15. It was visible for 12 months in all and was 'very conspicuous early in October' with a bifid tail 15° long. An elliptic orbit assigned, period 4386 years."

8. 2. 26. = **1287**. Organ Mtns. "In a ride Northward to the Mule- and to the Cow-Curráls and to the Horse Curral and Milho Roça"*. Less detailed data have hitherto been given from the Geographical Catalogue.

A Westwood's label reads "Capt. No. 580; 30. 10. 25; 8. 2. 26; 7. 3. 26; 19. 3. 26." Westwood's list agrees with this label.

7. 3. 26. 2 = **1288, 1289**. Rio de Janeiro. "At Catombí." Bz. 9. 3. 26. = **1290**. Rio de Janeiro.

A Westwood's label reads: "Capt. 29. 10. 25; 7. 11. 25; 7. 3. 26; 9. 3. 26 (2 inds.); 13. 3. 26; 21. 3. 26 (2 inds.); 1. 4. 26." Another Westwood's label bears the name "*Hel. Eucrate* V." Westwood's list agrees with these two labels, and, like the first, records an additional specimen with the date 9. 3. 26, and another with 21. 3. 26.

¹ Hübner's *eucrate* is a synonym of *narceæ*, Godt.

Bz. 13. 3. 26. = **1291**. Rio de Janeiro.

19. 3. 26. = **1292**. Rio de Janeiro. "In the valley of Catombí." A Westwood's label reads, "*Heliconia Eucrate* [*Isabellina*]¹." The parentheses are Westwood's.

21. 3. 26. = **1293**. Rio de Janeiro. "Along the Carioca Aqueduct."

Westwood's list records one other specimen of this date.

10. 12. 29. = **1294**. Pará. Data erroneous.

This date is omitted from Westwood's list and from his labels on **1287** and **1290**. It is erroneous, not only on the evidence of Westwood's records, but because the date indicates a locality considerably to the north of that in which all the other captures of this species were made by Burchell, as well as to the north of the locality (South Brazil) given by Stichel².

In attempting to reconstruct Burchell's original labelling, assistance may be derived from **104**, a specimen of *Mechanitis polymnia*, now bearing the date 30. 10. 25, indicating a locality considerably to the south of that in which the other individuals of this species were captured. Reasons were given in Ann. & Mag. Nat. Hist., April 1904, p. 320, for believing this label to be probably erroneous, and it was, moreover, suggested that the date on one of the additional specimens of *M. polymnia*, recorded by Westwood, viz. 3. 3. 28 or 10. 12. 29, was originally borne by **104**. Now the latter of these dates is at present erroneously borne by the *Heliconius* **1294**, to which it may have been accidentally transferred from **104**. If we furthermore suppose that **1285** (type form) bore the date 30. 10. 25, now on **104**, and **1294** (variety) bore 29. 10. 25, now on **1285**, the labelling of these three specimens would agree with Westwood's records and with the probable localities of both *Heliconius* and *Mechanitis*.

Westwood's list and labels on **1287** and **1290** give the following dates not now to be found on any existing specimen of *H. narceæ*:—30. 10. 25, Minas Geraes (see above); 1. 4. 26, Rio. Two other additional specimens are referred to under **1290**.

Opposite to the data "No. 580; 30. 10. 25; 8. 2. 26; 7. 3. 26; 19. 3. 26," Westwood had written in the list: "*Heliconia Eucrate* (*Isabellina*): al. ant^o. dimid^o. basali fulvo fascia obliqua nigra ad apicem cellulæ—macula subapicali alba." Similarly opposite to the data "29. 10. 25; 7. 11. 25;

¹ H. W. Bates's *isabellinus* is placed by Stichel as a subspecies of *numatus*, Cram., allied to *narceæ*.

² Bahia and Espirito Santo are the actual localities in S. Brazil cited by Stichel.

7. 3. 26; 9. 3. 26. 2 ind^s.; 13. 3. 26; 21. 3. 26. 2 ind^s.; 1. 4. 26," he had written: "Ejusd. var. (*Eucrate*) fascia media interrupta maculari. 9 ind^s." Nine of the fourteen Burchell specimens were thus separated as a variety, but, as pointed out under 1285 and 1294, the first date, "29. 10. 25," is now borne by an example of the type form, having been accidentally transferred since the time when Westwood's list was prepared. It is worth remarking that Westwood drew attention to the fact that one individual of the type form and one of the variety were caught on the same day, 7. 3. 26, by connecting the two copies of this date with a line.

Heliconius narcea polychrous, Feld.

- a. 29. 8. 27. = 1295. Between R. Pardo and R. Grände. "Cérvo to Paciência." "In the forest ascending the Morro de Batataes. *Papilionides*. In this forest Butterflies literally swarmed and thousands might have been caught in one day. I never saw such abundance in my life before."

A Westwood's label reads, "*Heliconia polychrous* Felder Pl. 47 f. 7." ["Lepidoptera of the Novara Expedition. Plates. (Reise der Oesterreichischen Fregatte Novara). Vienna. 1864-1867."]

Westwood's list agrees; and the following description is written opposite to the date of this specimen: "*Heliconia Polychrous* Felder: ant^s. alis intra cellulam flavo nec fulvorofo variegatis."

[It is to be observed that, although Burchell captured this single specimen of *polychrous* rather to the north of the localities in which he took *narcea*, Stichel gives S. Brazil for both forms, and there is no doubt that they fly together over a wide area. Hence, according to the reasonable principles of Rothschild and Jordan, they should be considered as distinct species and not as subspecies.—E. B. P.]

Heliconius numatus superioris, Butl., var.

- Bz. 4. 12. 28. ♀ = 1296. Porto Real. "Walk to the Igarapé." "*Papiliones*, caught in the woody campo; but the long-wing[ed] one is only found in forests in the shade."

It is exceedingly probable that the above-quoted description refers to this specimen (see 877, Ann. & Mag. Nat. Hist. ser. 8, vol. iii., Jan. 1909, p. 10). The "4" of Burchell's Bz. label is partly torn away; but there is no real doubt about the figure, which Westwood also read as a "4."

Burchell's specimen (1296) departs from the pattern of *numatus superioris* as represented by Stichel in Wytsman's 'Genera,' p. 7, fig. 2, in the fact that the three subapical yellow spots, characteristic of the fore wing upper surface, are evanescent, although just visible. The faint indications of two additional pale spots nearer the apex can also be made out on the fore wing of 1296. These spots, which are more distinct and white on the under surface, resemble those figured in the var. *geminata* (Stichel, *l. c.* p. 7, fig. 3).

Westwood's list agrees: but he united this specimen and *Hel. ethilla numismaticus*¹ under one species, *Hel. numata* (see 1299). Opposite to the list of dates he wrote, "*Heliconia Numata*: maculis 3 flavis ad apicem alar. antic^m.: mac. marg. al. post. flavis."—Moreover, between the "3" and "flavis" he drew a diagrammatic representation of the three yellow spots. The patterns of the three individuals placed under *numata* by Westwood (1296, 1299, and 1300) are remarkably similar,—least so in the case of 1299, which he thought was perhaps a variety of this species. See also the observations made under 1299.

Heliconius silvana silvana, Cram.

15. 11. 29. = 1297. Pará. S. José. "Caminho de Chamonte." A Westwood's label reads, "*Hel. Sylvana*."

Westwood's list agrees, and the following description is written opposite to the date of this specimen: "*Heliconia Sylvana*: alis ant^s. ultra cellulam fasc. 2 macularibus flavis."

Heliconius silvana robigus, Weym.

21. 3. 26. = 1298. Rio de Janeiro. "Along the Carioca Aqueduct." A Westwood's label reads, "*Sylvanae prop. Mac. 1 alba*."

By the last words Westwood undoubtedly refers to the large, conspicuous submarginal spot of the hind wing, which is also the first counting from the costa. This spot is, however, yellow and not white on the upper surface, as Westwood clearly pointed out when he described the same specimen (1298) in his list, writing opposite to the date 21. 3. 26:—" *Hel. Sylvanae proximo*: alis ant^s. ultra cell. fascia subapicali flava: al. p. puncto unico flavo anguli externi." There is, in fact, no white marking on the upper surface of 1298, but, on the under surface, the corresponding spot is white. It is

¹ In Stichel's classification, which is here followed, *numatus* is separated from *ethilla* by *silvana*.

of course possible that Westwood was referring to the under surface in his label attached to the specimen, but it seems on the whole more probable that "alba" was inadvertently written instead of "flava." There can be no doubt that the words of the label and the list refer to the same specimen, viz. **1298**.

Heliconius ethilla numismaticus, Weym.

29. 7. 29. = **1299**. Pará.

Westwood, in his list, described this specimen as varying from the typical "*Hel. Numata*," and wrote opposite to it: "Ejusd. [i. e. *Hel. Numata*] var.??: fascia obliqua nigra al. ant. ante fasc. flavam, maculisq. marg. alar. post. subtus flavis nec albis."

Westwood's description is, as is nearly always the case, absolutely correct, and affords convincing evidence that there has been no accidental transference of data. This conclusion not only holds for **1299**, but for all five *silvana*-like specimens, **1296-1300**, which Westwood grouped in a manner very different from that here adopted from Stichel. No part of this difference is to be explained by subsequent accidental transposition of Burchell's labels.

18. 12. 29. = **1300**. "in sylvis umbrosis." Pará. "Rivulet above Arsenal." A Westwood's label reads, "*Hel. Numata*."

Westwood's list agrees: for his description of this specimen see **1296**.

Cohort iii. MELPOMENEFORMES.

Heliconius melpomene thelxiope, Hübn.

Bz. + 2. 20 p. 22. 5. 29. = **1301**. Rio Tocantins. Just S. of, and the day before reaching, the Itabóca cataract.

7. 6. 29. 2 = **1302, 1303**. On the Rio Tocantins, just above (S.W. of) Pará. "Sta. Anna."

The large yellow and somewhat constricted spot towards the end of the cell in the fore wing of this subspecies is much reduced and divided at the constriction into two spots in **1302**, and is altogether absent from **1303**.

Westwood also noted the condition of this feature in **1302** and **1303**, as is shown by the following description written opposite to their dates in his list:—"Thelxiope var. [**1303**] var. ult^a. præcedentis [i. e. of the typical '*H. Thelxiope*'] mac. in cellula al. ant. oblitterata." "*Thelxiope* var. [**1302**] simillima [to **1303**] sed macula parva bipartita flava in cellula

al. ant." He also described the first specimen [1303] thus: "Al. ant. absq. mac. flav. in cellula. 1 [individual]"; and noted that these varieties were "both taken on same day,"—7. 6. 29. Westwood does not record these two specimens on his label, probably because of their variability from the type. (See 1312.)

18. 6. 29. 2 = 1304, 1305. Pará.

A Westwood's label on 1304 reads "*Heliconia Thelxiope* Hubn. S. Ex. Sch. pl. 12. and Var without detached spot." Plate 12 is in vol. i. of J. Hübner's 'Sammlung exotischer Schmetterlinge,' Augsburg, 1806.

The detached spot between the first and second median nervules of the fore wing is absent from 1305, but not from 1301-4; its absence or abnormally small size will be noted in each case under the corresponding number.

Bz. + 18. 6. 29. = 1306. Pará.

Detached spot absent except for a minute trace. Westwood's list records one other specimen of this date.

20. 6. 29. = 1307. Pará.

1. 7. 29. 2 = 1308, 1309. Pará. "Walk to the Caza de Pao."

The detached spot is small on the left side, and exists only as a minute point on the right of 1308. It is altogether absent from 1309. An additional small yellow spot occurs in the centre of the fore wing cell of 1308. A Westwood's label on 1309 reads "*Helic. Thelxiop.*"

Westwood's list refers in the following note to the fact that two individuals of this species and two of *H. erato amazona* were caught on the same day:—"so that 2 ind^s. of this and 2 of the precedg. (♂ & ♀) were taken on same day 1. 7. 29." There can be little doubt that this note was intended to draw attention to the coincidence in habits between two species that were considered until quite recently to be very closely allied.

4. 7. 29. = 1310. Pará. Detached spot absent. Westwood had removed and mounted on a card, affixed to the pin, one of the anterior legs of this specimen.

12. 7. 29. = 1311. Pará. Westwood's label bears "♀."

29. 7. 29. = 1312. Pará. A Westwood's label reads, "Capt. 22. 5. 29; 18. 6. 29 (4 ind^s.); 20. 6. 29; 1. 7. 29 (2 ind^s.); 4. 7. 29; 12. 7. 29; 29. 7. 29 (2 ind^s.); 8. 12. 29."

Westwood's list records all the dates mentioned on this label, and similarly includes one other specimen with the date 29. 7. 29. The list includes in addition and describes

under "*H. Thelxiope* var." the two specimens caught on 7. 6. 29. (See 1302-3.)

8. 12. 29. = 1313. "In sylva." Pará.

Westwood's list agrees except for the differences above alluded to. Opposite to the list of dates he wrote: "*Helic. The[?]xiope*: alis post. fasc. obliqua fusca ad marg. anal. extensa ♂ & ♀." In the same place he thus describes a variation of the above: "*Thelxiope* variat. macula postica oblitterata." It is evident that by "macula postica oblitterata" Westwood referred to the "Var. without detached spot" mentioned under 1304.

Heliconius nanna nanna, Stich.

Heliconius nanna of Stichel (l. c.), but here distinguished from the following subspecies, *H. nanna burchelli*.

6. 12. 25. ♂ = 1314. Rio de Janeiro. "On the Corcovado Mountain." "In an excursion to the Summit of the Corcovado by the road by the Convent of S^{ta}. Theresa and along the Aqueduct." The Cat. pl. Braz. MSS. contains the following full account of the localities in which Burchell collected, Dec. 6th, 1825 (the catalogue numbers of the botanical specimens are omitted): "On the Corcovado Mountain. On the Summit, and in the Forest which clothes the highest part of the Mountain... Along the more open part of the road, from the forests to the head of the Aqueduct... Along the upper end of the Aqueduct, as far as the spot where the road crosses it to the northern side, and where the collection of 15. 9. 25 ended..."*

There is no trace of a yellow spot at the end of or above the fore wing cell.

Heliconius nanna burchelli, Poulton¹.

2. 3. 29. ♂ = 1315. Porto Real. The male type of the subspecies. "*Papilio*. The brown winged (*Horta*) with a red patch on the upper wings, is always found

¹ [*Heliconius nanna burchelli*, subsp. n. When studying Burchell's *Heliconiinae* with the author of this memoir, I observed that the single specimen (1314) of *H. nanna*, Stich., from Rio, where Burchell took large numbers of *H. erato phyllis*, differed from the five individuals (1315-1319) taken by him to the north-west of the area in which he captured the species last named.

In the single specimen of *nanna* from Rio, the lower hind marginal border of the oblique red bar, forming the most conspicuous feature of the fore wing upper surface, is produced into two well-marked projections or

in shady woods and forests. I have seen it in similar situations in every part of Brazil I have visited."

The yellow spot above the end of the fore wing cell is very distinct in this specimen.

In the above quotation from the Brazilian note-book, the description of "the brown winged (*Horta*)" applies not only to *Hel. nanna*, but also to *Hel. erato phyllis*, which latter Burchell collected in large numbers in Rio de Janeiro and its vicinity (see 1356-1409 A). Although these two species belong to different sections of the *Heliconiinae*, and are only distantly related, their superficial likeness to each other is so striking and their habits are evidently so essentially similar that Burchell, who was an extraordinarily acute observer, considered them to be a single species, widely distributed throughout the parts of Brazil visited by him. Until the

teeth, much resembling the form of the same marking in *erato phyllis*. Above the outer projection there is to be seen, on the external border of the bar, another minute tooth, resembling the step-like break which is more or less developed at the corresponding point in the bar of *erato phyllis*.

In all five individuals taken outside the area in which Burchell captured *erato phyllis*, the margin of the bar has a very different appearance, the tooth-like form being wanting, or, in the case of the lowest point, represented by a shortened and more rounded projection. The margin is in this respect very similar in all five specimens. Furthermore, in four individuals out of the five, a yellow spot, lying between the costa and the distal end of the fore wing cell, is more or less distinct. This spot is wanting from the Rio specimen (1314), although present in some of the fifteen individuals on which Riffarth's description is based (Berliner ent. Zeit. 1901-2, vol. xlv. p. 106).

Mr. W. J. Kaye has kindly allowed me to examine three specimens of *H. nanna* from his collection, and I find that they are consistent with Burchell's. Two (a female from Rio and a male from Espirito Santo) resemble 1314: one (a female from V. Nivac, Matto Grosso: Nov. 1904) resembles 1315-1319. The latter possesses the yellow spot, and the "teeth" are even more rounded off or flattened down than in Burchell's specimens.

Mr. Guy A. K. Marshall, who kindly examined the material in the British Museum for me, finds that two specimens of *H. nanna* from Pernambuco and two from Itaparica (an island off Bahia) resemble 1314, while one, in the Godman-Salvin Collection, from Chapada, is of the other form. Specimens of *H. erato phyllis* exist in the British Museum or Godman-Salvin collections from Bahia, Pernambuco, and still further north.

There is no doubt that Stichel's *nanna* is the form with the toothed bar from the area of *H. erato phyllis*. I have not been able to consult the original description (Ent. Zeit. Guben. vol. xii. p. 143), but, in his monograph in the 'Genera Insectorum,' Stichel gives South Brazil as the range, and Espirito Santo and Minas Geraes as localities. He furthermore indicates that the *nomen nudum* "*bidentatus*" of Staudinger's lists,

last few years the two species have never been distinguished by any systematist, and they are still unseparated in every collection that has failed to take into account the researches of Riffarth and Stichel. The remarkable character of the resemblance will be realized when it is remembered that Westwood, having before him the whole series of 69 Burchell specimens (including 6 *H. nanna*), wrote on a label affixed to 1395,—“69 individuals in full of this species without any variation of the least importance taken betⁿ. 24. 10. 25 & 24. 3. 29. See list in my Burchell Catalogue.”

[In attempting to understand Burchell's use of the name “*horta*” it is important to ascertain the various forms to which he applied it. These are as follows:—

(1) True *Heliconiinae*, such as *H. nanna* and *H. erato phyllis* (see 1315);

(2) The *Ithomiinae*, *Mechanitis lysimnia* or *Ceratinia deta*

applies to *H. nanna*. The toothed bar of *H. nanna* is also carefully described by Riffarth (in *Berliner ent. Zeit.* 1901-2, vol. xlv. p. 106), and by Stichel and Riffarth in ‘*Tierreich*,’ vol. xxii. p. 134 (Berlin, 1905).

I therefore suggest the name *burchelli* for the subspecies in which the lower end of the red bar crossing the fore wing is not toothed or bears only a trace of the lower tooth. This subspecies is found over an area of unknown extent lying to the north and west of the Brazilian range of *H. nanna nanna* and *H. erato phyllis*.

♂ type from Porto Real (Nacional) on the R. Tocantins: captured Mch. 2, 1829, by W. J. Burchell: (1315) in Hope Department, Oxford University Museum.

♀ type from Villa Nivac, S.E. of Matto Grosso (Nov. 1904), in coll. W. J. Kaye.

H. nanna burchelli appears, as Mr. W. J. Kaye has suggested to me, to be a form of *H. melpomene amandus*, Grose-Smith and Kirby, from Bolivia and Peru. Mr. Kaye has kindly given me the opportunity of examining two males of this species from the Mapiri R., E. Bolivia. Both of these possess the yellow spot usually found over the end of the fore wing cell in *H. nanna burchelli* and sometimes in *nanna nanna*. The only essential difference between the two forms is due to the loss in *burchelli* of nearly the whole of the red area within the fore wing cell of *melpomene amandus* and the distal lengthening in the former of the yellow hind wing band of the latter. Another closely related form is, as Mr. Guy Marshall suggested to me, *H. amaryllis rosina*, Boisd., from Colombia, Panama, and Costa Rica. This subspecies is, however, without the longitudinal yellow streak which is so conspicuous a feature in the basal half of the fore wing of *melpomene amandus* and the forms of *nanna*.

It is probable that all the forms mentioned in the preceding paragraph will prove to be subspecifically related, *melpomene amandus* bearing this relationship to *amaryllis rosina* in the north and to *nanna burchelli* in the east. However this may be, there can be no doubt that *nanna nanna* is a geographical race of *burchelli*, produced to the east and south of the latter, under the influence of *H. erato phyllis*.—E. B. P.]

(see note on 108 and 97, Ann. & Mag. Nat. Hist. ser. 7, vol. xiii., April 1904, pp. 321 & 319 respectively);

(3) The Ithomiinæ with transparent wings, such as *Pteronymia euritea*, *Pteronymia hemixanthe*, and *Heteroscandyanetta*, as the following note, in the Cat. pl. Braz. MSS. 701-3461, shows:—"1287. Ex Liatrideis. Planta herbacea erecta 5-ped. floribus albis. Hanc quoque vidi in Minas Geraës copiosè, ubi frequentatur a variis Papilionibus ex genere *P. Hortæ*, alis diaphanis."* We also find under the date Feb. 24, 1826, when Burchell was collecting "Between the foot of the [Organ] Mountains and Frechal," the following entry:—"2577. Syngenesia. Flores albi... Delectus papilionum variarum, sed præsertim ex genere *P. hortæ*."* The name "*Horta*" occurs in reference to 39, and the white-flowered *Liatridea* under 36¹, but the above more detailed descriptions from the Cat. pl. Braz. had not been found when the account of these early numbers, 36, 39, &c. was prepared for publication.

(4) The abundant South-African *Acræa horta*, Linn., captured in large numbers by Burchell. There are now in the Hope Department at least 15 specimens taken by him, Jan. 1, 1815, at the Buffeljaght's River, near Swellendam.

On his return home Burchell named his African collection by comparison with the Banksian cabinet, then in the rooms of the Linnean Society, now at the British Natural History Museum. His notes exist at Oxford, and show that he obtained from this source the name "*P. Hortæ*" for the common S. African *Acræa*. The manuscript bears the following interesting heading:—

"The following notes are the result of a collation of the whole of my African collection of insects, with the Banksian Cabinet (now belonging to the Linnean Society) the greatest part of which is named in the handwriting of Fabricius. 1823 to 1824." The words "but I fear some labels had been misplaced." were added at a later date.

In the Banksian cabinet it can now be seen that the African *Acræa horta* stands as one of the group "*Heliconii*," in which are included not only *Acræinæ*, but *Heliconiinæ* and *Ithomiinæ*—in fact, all the subfamilies to which Burchell applied the term "*Horta*" or of which he wrote "belonging to the genus of *P. Hortæ*." The evidence now brought together makes it clear that by "*Horta*" Burchell meant to imply a place in the Fabrician "*Heliconii*," the group headed by *Acræa horta*, a species well-known to him before he started,

¹ Ann. & Mag. Nat. Hist. ser. 7, vol. xiii., April 1904, p. 313.

in 1825, on his Brazilian expedition (Fabricius, Syst. Ent., Ins., 1775, p. 459. no. 69).—E. B. P.]

Bz. 2. 3. 29. ♂ = **1316**. Porto Real. (As **1315**.)

The yellow spot is altogether absent.

16. 3. 29. ♂ = **1317**. Porto Real.

A minute trace of the yellow spot.

24. 3. 29. ♂ = **1318**. Porto Real. "Mánga."

The yellow spot distinct.

Bz. + 24. 3. 29. ♂ = **1319**. Porto Real. "Mánga."

The yellow spot minute.

Westwood's list agrees, but the dates will be found included among those of *Hel. erato phyllis* (see **1315** and the paragraph after **1409 A**).

Section II. OPISORHYPARI.

Cohort iv. EGERIFORMES.

Heliconius burneyi burneyi, Hübn.

20. 9. 29. = **1320**. Pará. "S.E. of S. Joze." A Westwood's label reads, "*Heliconia Burneyi*. Hb. Zutr. f. 401. 2." [J. Hübner and C. Geyer's 'Zuträge zur exotischer Schmetterlinge.' Augsburg. 1818–1831.]

Westwood's list agrees. Opposite to the date he wrote, "*Heliconia Burneyi*: al. ant. maculis flav. mediis."

Cohort viii. ANTIOCHIFORMES.

Heliconius antiochus zobeide, Butl.

25. 8. 29. = **1321**. "intra urbem." Pará. S. José.

A Westwood's label reads, "*Heliconia Antiocha* Var. without yellow stripe on median vein and white middle bar broken in centre."

Westwood's list agrees with this label: and the following description is written opposite to the date: "*Heliconia Antiocha* var.: blue black f. w. with 2 white oblique stripes." The white bar referred to in the label is the lower and more median of the two stripes on the fore wing, mentioned in the list.

Heliconius sara sara, F.

(Probably not a Burchell specimen.)

8. 11. 29. = **1322**. Pará. "S. of S. Jozé."

Westwood's list includes this date, but it is almost certain that Burchell's label has here become associated with a

butterfly never taken by this naturalist, having been accidentally transferred from a specimen of *H. sara thamar* which should follow 1346. Mr. W. J. Kaye, who originally determined 1322, has again carefully examined it at our special request. He still believes, and we agree with him, that 1322 did not come from any of the localities visited by Burchell, but from the range of *sara sara*, given by Stichel as Venezuela, Colombia, and Panama (?).

Westwood places the date of 1322 (three examples) in a list which includes, under the name *sara*, both the following subspecies. Of these three examples only one (1346) can now be found. There is no example of *H. sara thamar* without data in the Hope Department which can now be pointed out as likely to have been captured by Burchell; and the specimen which originally bore the Burchell label of 1322 is probably lost.

Heliconius sara apseudes, Hübn.

28. 10. 25. = 1323. Minas Geraes. "In the Forest on the West and on the East side of S. João de Nêpomucéna." (See 1285.)

6. 12. 25. = 1324. Rio de Janeiro. (As 1314.)

7. 3. 26. 2 = 1325, 1326. Rio de Janeiro. "At Catombí."

7. 3. 26. = 1327. "Catombi." Rio de Janeiro.

9. 3. 26. = 1328. Rio de Janeiro.

Bz. 9. 3. 26. = 1329. Rio de Janeiro. The last figure of the year, which is rather like an "8," is shown by examination with a lens to be a "6,"—a conclusion also adopted in Westwood's list, which is in his own handwriting.

Westwood's list records one other specimen of this date.

12. 3. 26. = 1330. Rio de Janeiro. "Aqueduct."

Westwood's list records one other specimen of this date.

16. 3. 26. = 1331. Rio de Janeiro. "In the upper part of the valley of Catombi, and along the road thence to Rio Comprido and Matto Porcos."

Bz. 16. 3. 26. = 1332. Rio de Janeiro. (As 1331.) The last figure of the year is here, as in 1329, somewhat like an "8," but Westwood's and our own examination agree in reading it as a "6."

Bz. 17. 3. 26. = 1333. Rio de Janeiro. "Along the Carioca aqueduct, and descending the high hill (mentioned 31. 1. 26) into the Valley of Catombi. But they were mostly along the aqueduct; and only a few on the hill."

For the data of 31. 1. 26, see 1378.

Bz. 18. 3. 26. = **1334**. Rio de Janeiro. "Along the Carioca aqueduct."

21. 3. 26. = **1335**. Rio de Janeiro. "Along the Carioca Aqueduct."

A Westwood's label reads, "Capt. 28. 10. 25; 6. 12. 25; 7. 3. 26 (3 ind.); 9. 3. 26 (3 ind.); 12. 3. 26 (2 ind.); 16. 3. 26 (2 ind.); 17. 3. 26; 18. 3. 26; 21. 3. 26; 27. 3. 26 (2 ind.); 1. 4. 26; 3. 4. 26 (3 ind.); 28. 10. 27; 29. 7. 29 (2 ind.); 6. 9. 29 (2 ind.); 20. 9. 29; 8. 11. 29 (3 ind.)." Westwood's list agrees with this label.

27. 3. 26. = **1336**. Rio de Janeiro. "From the Village of São Domingos to the island of Boa Viagem." "On the main-land about Fort Boa Viagem." "In a walk from the village of São Domingos to the Island of Boa Viagem and along the shore of the Mainland eastward for about half a mile." * In addition to this, the Cat. pl. Braz. MSS. contains the following more detailed account of the localities in which Burchell collected on this date: (the catalogue numbers of the botanical specimens are here omitted:) "... In the village of São Domingos . . . Between São Domingos and Boa Viagem. . . . Along the shore of the bay; from Boa Viagem eastward to where the high rocky cliffs obstruct the path farther, excepting at low water." *

Bz. 27. 3. 26. = **1337**. Rio de Janeiro. (As **1336**.)

3. 4. 26. 2 = **1338, 1339**. Rio de Janeiro. "Along the Carioca Aqueduct."

Bz. 3. 4. 26. = **1340**. Rio de Janeiro. "Along the Carioca Aqueduct."

Besides the additions above alluded to, Westwood's list and label on **1335** give 1. 4. 26, Rio de Janeiro.

It has already been mentioned (see **1322**) that this form is included with the following subspecies under *Hel. sara* in Westwood's list.

Heliconius sara thamar, Hübn.

Bz. + 28. 10. 27. = **1341**. "Sylv." is on the Bz. label, "in sylva" on the English label. Between Meia Ponte and Goyaz. "S. Joaquim to Sapezál."

Bz. 29. 7. 29. = **1342**. Pará.

Westwood's list records one other specimen of this date.

6. 9. 29. = **1343, 1344**. Pará. "Walk [to] a rocinha near the Nazareth church."

20. 9. 29. = **1345**. Pará. "S.E. of S. Joze."

8. 11. 29. = **1346**. Pará. "S. of S. Jozé."

Westwood's list records two other specimens of this date. It is probable that the label of one of the missing specimens was accidentally transferred at some unknown date to **1322**. It may have been so transferred before Westwood's list was written; for **1322**, no less than the two subspecies which follow it, would have been formerly identified as *H. sara*.

Except for the above-mentioned discrepancies, Westwood's list agrees. Opposite to the list of dates he wrote the following brief description, which is equally applicable to all three subspecies:—

“*Hel. Sara*: blue black with middle & subap^l. yellow bar in f. w. 30 [individuals].”

Cohort ix. ERATOFORMES.

Heliconius erato amazona, Staud.

19. 5. 29. = **1347**. On the Rio Tocantins. “Aragnáy.” [S. João da Araguay.] The town of S. Francisco appears in modern maps opposite to the confluence of the R. Araguay with the R. Tocantins.

A Westwood's label reads “*Helic. Vesta*? Cram. pl 119 A.” The “?” has been erased in the same Indian ink as that in which the words are written,—therefore probably by Westwood himself. Plate 119 is in vol. ii. of P. Cramer's ‘*Papillons Exotiques des trois Parties du Monde, l'Asie, l'Afrique, et l'Amerique*. Amsterdam and Utrecht. 1779–1791.’ Cramer's *vesta* is a synonym of several of the subspecies of *erato*, Linn., including *erato amazona*.

It is to be noted that there is on the fore wing of this specimen a yellow spot below the first submedian nervule which is not found on any of the other individuals of this species captured by Burchell. This specimen is also peculiar in that the outer part of the red area below the cell of the fore wing upper surface bears a white V-shaped mark, more strongly developed on the right side.

20. 6. 29. = **1348**. Pará.

This date is omitted from Westwood's list and from his label on **1352**, but appears under *Eueides tales pythagoras* (see **1437**).

1. 7. 29. 2 = **1349**, **1350**. Pará. “Walk to the Caza de Pao.”

In the case of both **1349** and **1350**, Westwood had removed and mounted on a card, affixed to the pin, one of the anterior legs. A Westwood's label on **1350** reads “*Heliconia Vesta*.”

7. 7. 29. = **1351**. Pará. "Eastward of my house." The yellow spot at the apical end of the fore wing cell is divided into two in this specimen.

Westwood's list and label record one other specimen of this date.

29. 7. 29. = **1352**. Pará.

A Westwood's label reads "Capt. 19. 5. 29; 1. 7. 29, 2 ind^s.; 7. 7. 29, 2 ind^s.; 8. 7. 29; 29. 7. 29; 1. 8. 29; 15. 11. 29; 1. 2. 30." Westwood's list agrees.

Bz. + 1. 8. 29. = **1353**. Pará.

15. 11. 29. = **1354**. Pará. S. José. "Caminho de Chamonte."

1. 2. 30. = **1355**. "At Pará. In the forest S.S.E. of S. Jozé." The yellow spot at the apical end of the fore wing cell is here, as in **1351**, divided into two, and the costal member of the pair is only vestigial.

Besides the addition above alluded to, Westwood's list and label give 8. 7. 29, Pará. It is possible that he here accidentally includes the date on **1442**, a specimen of *Eueides tales pythagoras*, omitted from his list of this latter species (see **1442**). Opposite to the list of dates he wrote "*Heliconia Vesta*. Al. ant. mac. flava obliqua ♂ & ♀"—and he made a diagram showing that he referred to the oblique yellow spot between the first and second median nervules. In the same place he thus describes the variation in size of the spot in the cell of the fore wing:—"variat. magn. mac^s. flavæ in cellula al. ant."

Heliconius erato phyllis, F.

Bz. 147. II. [16. 8. 25.] = **1356**. Rio de Janeiro. "*Papilio*." "In a walk along the Aqueduct. Mile and a half above the Convent of Santa Theresa, at Rio de Janeiro—in Brazil."* Less detailed data have hitherto been given from the Brazilian note-book; it should be noted, however, that the latter reads: "129-151. Above the Theresa Convent; and on the woody hilly [hills] along the Aqueduct."

Westwood's list records two specimens bearing the number 147.

Bz. 316. I. [14. 10. 25.] = **1357**. Minas Geraes. "*Papilio*." Burchell notes that at 7.10 P.M. on this day he "arr.[ived] at Discoberto do Senora do Antonio Velho." "I killed a reddish snake and preserved it. V. J.¹"*

¹ Burchell's Brazilian Journal has unfortunately never been found. "V. J." stands for "Vide Journal."

(See 1284). He remained here till 27. 10. 25, when we find in his Cat. pl. Braz. "Leave Discoberto and arrive at S. Jao de Nepomucena." *

Bz. 357. I. [15. 10. 25.] = 1358. Minas Geraes. "*Papil[io]*. At the Discobérto do Antonio Velho." (See 1284.)

Bz. 562. I. [19. 10. 25.] = 1359. Minas Geraes. "*Pap[ilio]*." "At Descobérto do Rio Novo." * This is the "Discoberto do Antonio Velho" of the Brazilian notebook. (See 1284.)

Opposite "562" Burchell wrote "(147)," indicating his conclusion that both numbers were affixed to specimens of the same species.

Bz. + 853. I. 24. 10. 25. = 1360. Date as well as number on English label. Minas Geraes. "*Pap[ilio]*. About João Pedro's, at Discoberto: at the margin of the forest." (See 1284.)

Westwood's list refers to this specimen by its date alone.

29. 10. 25. = 1361. Minas Geraes. (As 1285.)

30. 10. 25. = 1362. Minas Geraes. "(In the forest). On the N.E. side of the arraial of São João de Nepomucena." (See 1285.)

6. 11. 25. 2 = 1363, 1364. Minas Geraes. "At Capt. Amáro Leite's." * (See 1286.)

7. 11. 25. 2 = 1365, 1366. Minas Geraes. (As 1286; and see 1285.)

Westwood's list records one other specimen of this date.

6. 12. 25. 2 = 1367, 1368. Rio de Janeiro. (As 1314.)

Westwood's list includes three specimens with this date.

The third is of course an example of *Hel. nanna* (1314.)

24. 12. 25. = 1369. Rio de Janeiro. "Aqueduct (on the first hill on the left)." The following full account of Burchell's movements on this date is given in the Cat. pl. Braz. MSS. 701-3461:—"Along the Aqueduct. Mostly on the first hill on the left, or S.E. side of the aqueduct . . . ; and in the thick woods, . . . on the same hill, quitting the aqueduct by the first opening or valley just above the stone quarry. Above the stone quarry . . ." * (The dotted lines represent the omitted catalogue numbers of Burchell's botanical specimens.)

29. 12. 25. 2 = 1370, 1371. Rio de Janeiro. "Catombí—Barra Vermélha—and Rio Comprido." "On a hill westward of Catombí, along a road turning southward out of the main road at Barra Vermelha to the Fazenda da Ladeira . . . and further along the main road to Rio Comprido . . ." * (The dotted lines represent the omitted catalogue numbers of Burchell's botanical specimens.)

10. 1. 26. = **1372**. Rio de Janeiro. "At Praia Grande and vicinity, and about S. João de Carahý." "In a walk from Praia-Grande to the Village of São João de Carahý and 2 miles further." * He also speaks of "the level inundated country beyond São João" *; and "along the road beyond the last mentioned level." *

Bz. + 11. 1. 26. = **1373**. Rio de Janeiro. "At Laranjeiros."

Westwood's list records one other specimen of this date.

14. 1. 26. 2 = **1374, 1375**. "Laranjeiros." on both labels. Rio de Janeiro. "Brought from and collected in the Valley of Laranjeiros. Omnia insuper plantas."

14. 1. 26. 2 = **1376, 1377**. Rio de Janeiro. (As **1374**.)

Westwood's list records one other specimen of this date.

31. 1. 26. 2 = **1378, 1379**. Rio de Janeiro. "Valley of Catombý and a high Mountain on the N.W. side of the Aqueduct." "All of this date were from off plants: mostly up the Valley of Catumbi." "Along the Valley of Catumbi and ascending a high Mountain on the N.W. side of the Aqueduct of Carióca." *

In addition to this, the Cat. pl. Braz. MSS. 701-3461 contains the following more detailed account of the localities in which Burchell collected on this date (the catalogue numbers of the botanical specimens are omitted, as indicated by the dotted lines):—" . . . In the Lower part of the valley, as far as the last houses . . . Along the Catumbi Aqueduct, to the head of the valley where it crosses it by a high wooden trough . . . In the ascent, from the head of the valley of Catumbi, up the high Mountain on the N.W. side of the aqueduct of Carióca . . . Along the Aqueduct of Carióca." *

Westwood's list records one other specimen of this date.

Bz. + 31. 1. 26. = **1380**. Rio de Janeiro. (As **1378**.)

9. 2. 26. = **1381**. Organ Mtns. "By the River Pacaqué (near Mr. March's Dwelling House)." *

12. 2. 26. = **1382**. Organ Mtns.

7. 3. 26. 2 = **1383, 1384**. Rio de Janeiro. "At Catombi."

Bz. 7. 3. 26. = **1385**. Rio de Janeiro. "At Catombi."

9. 3. 26. 3 = **1386, 1387, 1388**. Rio de Janeiro.

Bz. 9. 3. 26. 2 = **1389, 1390**. Rio de Janeiro.

10. 3. 26. 5 = **1391-1395**. Rio de Janeiro.

A Westwood's label on **1395** reads, "69 individuals in full of this species without any variation of the least importance taken betⁿ. 24. 10. 25 & 24. 3. 29. See list in my Burchell Catalogue." Westwood's list agrees with this label. It has already been pointed out that Westwood was here including two very different species. (See **1315**.)

Bz. 10. 3. 26. = 1396. Rio de Janeiro.

12. 3. 26. 2 = 1397, 1398. Rio de Janeiro. "Aqueduct."

Westwood's list records one other specimen of this date.

12. 3. 26. = 1399. "Carioca Aqueduct." Rio de Janeiro.

15. 3. 26. = 1400. Rio de Janeiro. "Catombi, in plantis."

Bz. 17. 3. 26. = 1401. Rio de Janeiro. (Carioca aqueduct.

(As 1333.)

18. 3. 26. = 1402. Rio de Janeiro. "Along the Carióca aqueduct."

20. 3. 26. = 1403. Rio de Janeiro. "Along the Carioca Aqueduct."

21. 3. 26. = 1404. Rio de Janeiro. "Along the Carioca Aqueduct."

Bz. 21. 3. 26. = 1405. Rio de Janeiro. "Along the Carioca Aqueduct."

22. 3. 26. = 1406. Rio de Janeiro. "Along the [Carioca] Aqueduct, nearly as far as its commencement at the head of the valley of Laranjeiros."* The latter word is usually spelled "Laranjeiros" by Burchell.

Bz. 1. 4. 26. = 1407. Rio de Janeiro. "In the valley of Catumbi."

Westwood's list records one other specimen of this date.

Bz. 19. 9. 26. = 1408. Santos.

Bz. 30. 4. 28. = 1409. Goyaz.

———. = 1409 A. This is probably a Burchell specimen which has lost its label; for it has precisely that appearance of age which is a characteristic of many Burchell specimens, but of no other example of this species in the Hope Department. The label appears to have been lost since Westwood's list was prepared, for no mention is there made of a specimen without data. The missing date may have been that of any one of the additional specimens of *II. erato phyllis* to be inferred from his list.

Besides the additional specimens already mentioned, and the six examples of *Hel. nanna* (1314–1319), Westwood's list includes the dates 3. 4. 26 (Rio de Janeiro) and 5. 2. 28 (Goyaz), which have not been found on any specimen. They probably indicate the former existence of two additional examples of *Hel. erato phyllis*.

Opposite to the list of dates Westwood wrote:—" *Hel. Phyllis*. 69 ind^s."

2. Genus. *EUEIDES*, Hübn.

Section II. BRACHYSCENÆ.

Cohort ii. VIBILIFORMES.

Eueides vibilia vibilia, Godt.

20. 3. 26. ♂ = 1410. Rio de Janeiro. "Along the Carioca Aqueduct."

Westwood's "Catal. A. 1" is on specimen, and on another label "*Meraui Eueides*." Westwood's list agrees with these labels. Hübner's *Colanis mereaui* is a synonym of *Eueides vibilia*, Godt.

22. 3. 26. b. ♀ = 1411. Rio de Janeiro. "Along the Carioca Aqueduct." The Brazilian note-book also adds: "Those marked *b* were purchased from some negro-insect-catchers, who caught them all in this spot and almost all were alive when I bought them." (See also 1406.)

Westwood's "Cat. A. 3" is on specimen, and on another label "*Eueides Vibilia*." Westwood's list agrees with these labels.

19. 3. 29. ♂ = 1412. Porto Real.

23. 3. 29. ♂ = 1413. Porto Real.

25. 3. 29. ♂ = 1414. Porto Real.

Westwood's "A. 1." (clerk's MSS.) is on specimen. Westwood's list agrees.

28. 3. 29. 2 ♂ ♀ = 1415, 1416. Porto Real.

Westwood's "A. 4." (clerk's MSS.) is on the ♂ (1415),—probably as the result of accidental transposition during manipulation. This number, in the list of "Burchell's *Acræa* &c.," stands for the mimetic Pierine butterfly "*Leptalis* [*Dismorphia*] *Astynome*." In the list itself the date 28. 3. 29 appears correctly under A. 1. and A. 3., and not under A. 4.

5. 4. 29. ♂ = 1417. Porto Real.

Bz. + 5. 4. 29. ♂ = 1418. Porto Real.

Westwood's list, A. 1. and A. 3., agrees. Opposite to the dates of the seven males, placed under A. 1., he wrote "*Euides Meraui*"; while underneath 20. 3. 26 "*Meraui Eueides*" appears in clerk's MSS. Similarly, opposite to the dates of the two females (22. 3. 26 *b* and 28. 3. 29, under A. 3.) Westwood wrote "*Euides Vibitia*." It is to be observed that Westwood omitted the second "*e*" of "*Eueides*" from his list of "*Acræa* &c.," but not from his labels.

Eueides pavana, Mén.

9. 2. 26. ♀ = **1419**. Organ Mtns. (As **1381**.) Westwood's "Cat. A. 2." is on specimen, and on another label "*Eueides Pavana*."

Westwood's list agrees. Opposite to the date he wrote "*Euides Pavana*"; while under it "*Eucides* [sic] *pavana*" is written in clerk's MSS.

Cohort iii. LYBIFORMES.

Eucides aliphera aliphera, Godt.

28. 10. 25. = **1420**. Minas Geraes. (As **1323**, and see **1285**.)

30. 10. 25. = **1421**. Minas Geraes. (As **1362**, and see **1285**.)

- p. 25. 2. 26. = **1422**. Organ Mtns. "Along the road between Frechal (under the Serra dos Orgãos) and the Town of Magé (excepting the 6 miles (English) of the latter part of the road). The whole of this road is in general, over a level low country, and the soil mostly of a sandy quality." *

20. 3. 26. = **1423**. Rio de Janeiro. "Along the Carioca Aqueduct."

22. 3. 26. = **1424**. Rio de Janeiro. (As **1406**.) Westwood's "A. 17." is on specimen.

Westwood's list agrees with this label.

- Bz. 22. 3. 26. = **1425**. Rio de Janeiro. (As **1406**.)

- Bz. 29. 1. 29. = **1426**. Porto Real. "Caught on the bank of the Tucantins, while measuring the base line."

This specimen is unrecorded in Westwood's list.

- Bz. 16. 2. 29. = **1427**. Porto Real. "Papiliones (3) caught on the flowers of a Malva in the backyard." (See also **660** and **1193**.)

- Bz. 19. 2. 29. = **1428**. Porto Real.

- Bz. 2. 3. 29. = **1429**. Porto Real.

Westwood's list records one other specimen of this date.

10. 3. 29. = **1430**. Porto Real. "Lepidoptera began to appear more numerous in the end of Feb'y., and since the beginning of this month they appear abundant."

17. 3. 29. = **1431**. Porto Real.

23. 3. 29. 2 = **1432, 1433**. Porto Real.

Westwood's list records one other specimen of this date.

5. 4. 29. = **1434**. Porto Real.

Besides the discrepancies above alluded to, Westwood's list includes an additional specimen with the date 21. 3. 26

(Rio de Janeiro). The data of this species not only appear as A. 17. in Westwood's "*Acræa* &c.," but also separately on a small slip of paper. In the first of these lists (only including four of the dates of *E. aliphera*) Westwood wrote the following description in reference to and opposite A. 16. (*Colænis julia*):—"Cethosia? orange red, with oblique brown bar in f. w."; while opposite to A. 17. (the species with which we are concerned) he wrote "d° smaller." The second list, on the other hand, which is altogether in Westwood's writing, and almost perfect, bears the heading "Small narrow winged *Colænis*."

As bearing upon Westwood's use of "*Cethosia*" and his inclusion of *Eueides* in the list of "*Acræa* &c.," it must be remembered that, in 1819, *vibilia*, *aliphera*, and *lybia* were placed in *Cethosia*, and *vibilia* and *aliphera* in *Acræa* (Godt. and Latr. Enc. méth. Zool., vol. ix. pp. 245 and 806).

Eueides lybia lybia, F.

7. 6. 29. = 1435. "S^{ta}. Anna." On the Rio Tocantins, just above (S.W. of) Pará. Westwood's "A. 18." (clerk's MSS.) is on specimen.

Westwood's list agrees with this label. The date of this species not only appears as A. 18. in Westwood's "*Acræa* &c.," but also separately on a small slip of paper. In the first of these lists he distinguished this species from the preceding (A. 17.) by writing opposite to its date: "d° smaller with broader wings & dark marks." The repeated date, written by Westwood himself, appears on the slip which bears the dates of *Eueides aliphera*. Below these he wrote "7. 6. 29" under the heading "small sp^s. d°. Like ditto but with broader wings fulv^s. with black margin."

Cohort γ. THALETOFORMES¹.

Eueides tales pythagoras, Kirby.

18. 6. 29. ♀ = 1436. Pará.

A Westwood's label reads "*Thales* Var. ? alt. Sexes?," and another "Var. Costa al. ant. basi fulva. al-p. radiis, rufis major⁶." By the first of these labels Westwood evidently doubted whether the peculiarities of pattern described in the second label were those of a variety or of sex. This interpretation is confirmed by his list, in which the words "Var.

¹ The number should be "iv.," for no other cohort intervenes in Stichel's classification between "iii. *Lybiformes*" and "v. *Thaletaformes*."

vel ♀" appear over "18. 6. 29," and are encircled by a line which also includes this date. It is somewhat strange that he makes no reference, on either specimen or list, to the similar pattern of 1441—the other female of this species captured by Burchell.

20. 6. 29. ♂ = 1437. Pará.

Westwood's list and label on 1440 record one other specimen of this date. It seems probable that he here accidentally includes the date on 1348, a specimen of *H. erato amazona* omitted from his list of this latter species.

Bz. + 26. 6. 29. ♂ = 1438. "Pará, near my house (Pombo roçinha)."

26. 6. 29. 2 ♂ = 1439, 1440. "Pará, near my house (Pombo roçinha)."

A Westwood's label on 1439 reads "*Thales (Eueides)*," and one on 1440, "Capt. 18. 6. 29; 20. 6. 29 (2 ind^s.); 26. 6. 29 (3 ind^s.); 1. 7. 29; 4. 7. 29." Westwood's list agrees with this label. 4. 7. 29 is not found on any existing Burchell specimen of this species.

1. 7. 29. ♀ = 1441. Pará. "Walk to the Caza de Pao."

Bz. + 8. 7. 29. ♂ = 1442. Pará.

This date is omitted from Westwood's list and from his label on 1440, but is given for *Hel. erato amazona*, although borne by no existing Burchell specimen of that species. It is possible that there has here been an accidental transposition of specimens by Westwood himself, or of labels at some later date. Another interpretation would be that "4. 7. 29" of his list and label is an erroneous rendering of "8. 7. 29." In either case the locality is Pará.

Westwood evidently at first mistook this species for a true *Heliconius*, and placed it, not in the list of "*Acraea* &c.," but in that of "*Heliconidæ*" next to the three species to which it bears a strong superficial resemblance, viz. *H. burneyi*, *H. erato amazona*, and *H. melpomene thelxiope*. Furthermore, he entered "7. 6. 29" among the dates of the *Eueides*, but indicated by means of a line that it really belonged to "*thelxiope*." These facts increase the probability that an accidental transference of the date of 1442 to the list of *erato amazona* has taken place.

Westwood's list agrees, except for the discrepancies above alluded to. Opposite to the list of dates he wrote, "*Eueides Thales*. Alis post^a. rufo-radiatis. Subtus al. post. maculis marg. albis."

XLV.—*On Hexactinellid Spicules and their Names.*—
Part II. *Supplementary.* By R. KIRKPATRICK.

(Published by permission of the Trustees of the British Museum.)

IN the 'Annals' for Feb. 1910 I sketched out a classification of Hexactinellid sponge spicules on a morphological basis. In the paper referred to it was stated that all Hexactinellid spicules could be arranged in two groups, viz. Holactine spicules without end-spines or distal appendages to their actines, and Astral spicules with end-spines or distal appendages at the end of the actines. In the present paper attention will be called to certain spicules which are undoubtedly holactine, but which have spines at one end of the ray. In spite of this fact these spicules do not belong to the astral group, for the spines are not end-spines or distal appendages. The spicules with these seemingly paradoxical characters are the clavulæ, scopulæ, and certain root-tuft spicules such as are found in *Hyalonema*.

The scopulæ, which are orientated more or less vertically at the dermal and gastral surfaces of certain Dictyonine sponges, are slender rods with two or more prongs projecting from the outer or surface end of the spicule. The axial canal extends the whole length of the rod, but the prongs are solid. Under a high power and with good light it is not difficult to see an axis cross—already figured by Schulze—in the usually swollen end whence the prongs emanate. Accordingly the scopula is a micromonactin with five aborted actines, the central or basal end of the rod being the end with the prongs. The *distal* or apical end, which is situated in the interior of the sponge, has no end-spines or distal appendages. Consequently the scopula is holactine and not astral. From the morphological point of view it is desirable to call appendages situated at the central end of monactine spicules by some distinctive name in contrast with such terms as "end-spine" or "distal appendage," and I suggest the designation "centrospine." Similarly the disks of clavulæ may be termed centrodisk as compared with the distal disks of amphidisk. For clavulæ likewise are micromonactins in which the axis-cross can be seen in the disk at the central end of the spicule. Of course it may be urged that anything beyond the point where the axial canal of the persisting actine joins the axial canals of the aborted actines should be regarded as belonging to the territory of the latter, and that the designation centrospine is not correct. The term is merely

suggested, however, to emphasize the fact that the distal end of the clavula or scopula is wholly devoid of end-spines or distal appendages.

The forms of the clavulæ and scopulæ present the same kind of contrast as that existing between amphidisks and hexasters. The distinction is purely a morphological one, however, for both clavulæ and scopulæ are found together in *Clariscopulia intermedia*, F. E. Sch. In the case of the amphidisks and hexasters the distinction is significant from the phylogenetic as well as the morphological point of view. Amphidisks and hexasters are astral, and clavulæ and scopulæ are holactine spicules. The latter belong to the subgroup of micromonactins, a category which should be placed below the microhexactins in the morphological scheme ('Annals,' l. c. p. 209).

The root-tuft spicules of *Hyalonema* are mega-monactins with centrodisk. Here again there are no end-spines at the true distal end of the spicule.

The remarkable uncinates with their highly specialized lateral spines are diactins, which should, I think, in spite of their large size, be classed as microscleres. Accordingly they would come under the category of microdiactins.

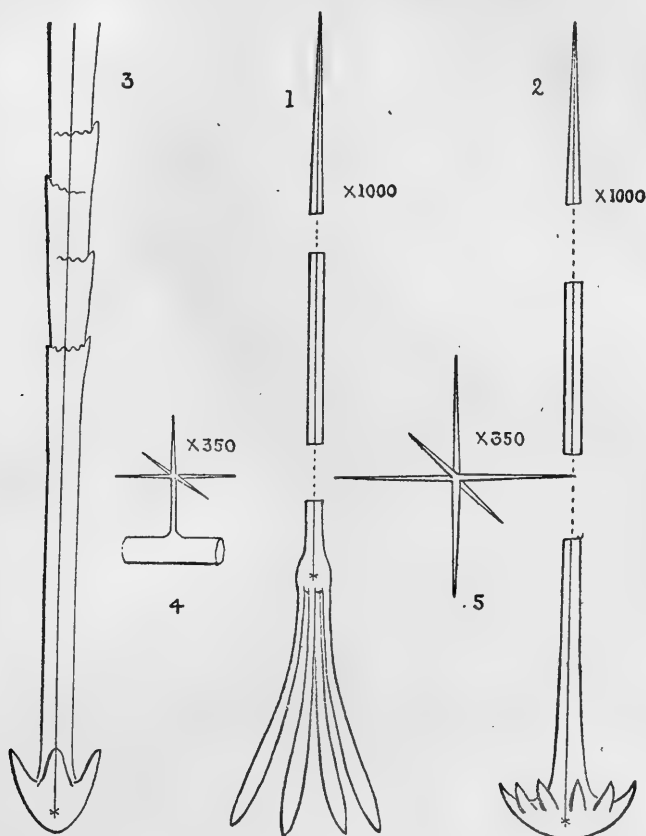
I take this opportunity of making a correction. In a paper "On the Phylogeny of the Amphidiscophora" ('Annals,' Nov. 1909, p. 479) I wrote:—"What appears to be a second character"—in Amphidiscophora—"is the existence of genuine microhexactins, which do not exist, so far as I have observed, in the Hexasterophora. (The small hexactins forming part of the framework in Dictyonine sponges are not here regarded as microhexactins)."

I have now found in certain Dictyonine sponges (*Eurete semperi*, F. E. Sch., &c.) microhexactins which could not be regarded as loose spicules which would later be welded so as to form part of the dictyonal framework. Accordingly the name Microhexactinophora could not be used as an alternative name to Amphidiscophora. Microhexactins seem to have entirely disappeared, however, from many Lyssacine sponges, in which the seeming hexactins are hexasters.

The hexasters in Dictyonine sponges are frequently of a primitive type, i. e. the actines are relatively long and the end-spines often little more than short thorn-like prickles; in more highly evolved hexasters the actines tend to become shorter and the end-spines longer, more curved, and tipped with toothed disks.

The total disappearance of microhexactins from so many of the Hexasterophora is surprising in view of the fact that

in numerous species the holohehexasters tend to become reduced to monohexasters which simulate the simple hexactin form.



- Fig. 1.—Scopolula of *Eurete semperi*, F. E. Sch., a holactine monactin with prongs or spines at its central end, but without end-spines at the distal or peripheral end, with axis cross at central end. Examined in glycerine. Camera lucida drawing, $\times 1000$.
- Fig. 2.—Clavula of *Farrea occa* (Bowerbank), Carter. In glycerine. Camera lucida drawing, $\times 1000$.
- Fig. 3.—Root-tuft spicule of *Hyalonema sieboldii*, Gray, a holactine monactine megasclera. Magnified.
- Fig. 4.—A small hexactin of *Eurete semperi*, F. E. Sch., welded on to the dictyonal framework. $\times 350$. After F. E. Schulze.
- Fig. 5.—A loose hexactin of *E. semperi*, F. E. Sch. $\times 350$. After F. E. Schulze.

Often it is obvious that monohexasters are reduced holohehexasters, because the end-spine of the former resembles each

one of a tuft of end-spines of the latter both in form and in position relatively to the actine.

The fact that occasionally microhexactins are found in *Hexasterophora* does not invalidate the theory that the distinctive features of *Amphidiscophora* and *Hexasterophora* may have been due to the running together, at an early stage, of the trabeculæ into strong surface laminæ in the former and not in the latter, thereby bending down the plastic end-spines of the reduced hexaster scleroblasts and giving rise to amphidisks.

Summary.—Clavulæ and scopulæ are holactine micro-monactins, and it is suggested that their spines and disks should be termed centropines and centrodisk, to distinguish them from the true end-spines and end-disks at the distal end of the actines of astral spicules.

Microhexactins, which were stated by me not to be present in *Hexasterophora*, occur in certain dictyonine species, but appear to be entirely absent from most of the *Hexasterophora*.

XLVI.—*A new Chinese Mole of the Genus Scaptochirus.*
By OLDFIELD THOMAS.

(Published by permission of the Trustees of the British Museum.)

THE British Museum has received from Mr. R. Gillies, of the Chinese Inland Mission, a mole of the genus *Scaptochirus*, and its examination shows not only that it is itself new, but that the species which I described in 1881 as *Talpa leptura* is after all a distinct species, and not an example with abnormal dentition of *S. moschatus*, as has been recently assumed.

Scaptochirus gilliesi, sp. n.

Size rather smaller than in *S. moschatus*, markedly smaller than in *S. lepturus*. Colour a darker shade of "broccoli-brown," that of *S. lepturus* paler brown, though this latter may be due to fading. Tail well-developed, almost naked, about as long as in *S. lepturus*, much longer than in *S. moschatus*, in which it is said scarcely to project beyond the fur and to measure less than a centimetre.

Skull apparently slightly smaller than in *S. moschatus*, much smaller than in *lepturus*, its middle region less narrow

in proportion than in the latter, the intertemporal constriction especially much less marked. Teeth smaller and lighter than in the other species, the distance from the front of the canine to the back of m^3 11.5 mm., as against 12.6 in *moschatus* and 14 in *lepturus*. Anterior breadth of m^1 2.5 mm., 2.9 in *moschatus*, and slightly more in *lepturus*. One minute lower premolar only, as usual in *Scaptochirus*, the condition in the type of *lepturus* being abnormal, as evidenced by other specimens since received from Peking.

Length of hind foot (c. u.) 19.5 mm.; breadth of fore 12.5; tail 16.

Skull: greatest length 30.7; basal length 26; greatest breadth 17.2; intertemporal breadth 7.8; palate length 13; front of canine to back of m^3 11.5.

Hab. Ho-tsin, S.W. Shan-si.

Type. Adult. B.M. no. 10. 3. 13. 1. Collected November 1909, and presented by Mr. Robert Gillies.

On the discovery that the additional lower tooth of the type of "*Talpa leptura*," which gave it the dental formula of *Parascaptor* and was the primary reason for my description of the species, was an individual abnormality, it was supposed that *lepturus* was only a synonym of *moschatus*. But I have recently had the opportunity of examining the typical skull of the latter in the Paris Museum, and find that it is decidedly smaller than that of *lepturus*, while the comparatively long tail of the latter also distinguishes it. *S. moschatus* was described as from "Chinese Mongolia," and probably comes from somewhere near or beyond Suen-hoa-fu, where David collected the majority of his "Mongolian" animals.

The Ho-tsin mole again would seem to form a third species of the group, slightly smaller than *S. moschatus*, with decidedly smaller teeth and with a tail as long as in the Peking animal.

XLVII.—Three new West African Mammals.

By OLDFIELD THOMAS.

(Published by permission of the Trustees of the British Museum.)

Perodicticus ju-ju, sp. n.

A grey member of the small-toothed group.

Size, judging by skull, about as in *P. batesi*. Fur close and woolly, much shorter than in *P. ibeanus*. Bristle-hairs

practically absent. General colour above "drab-grey," the other three W. African Pottos being of a more rufous brown colour. Whole of back uniform, without any darker colour on the fore back. Underfur grey at base (grey no. 6), then dull buffy whitish, the ends dark brown; the few longer hairs with light tips, not affecting the general colour. Under surface well defined greyish white, the hairs grey basally, whitish terminally. Outer surface of arms and legs drab-grey like back, inner surface whitish like belly, but becoming more drabby towards wrists and ankles; hands and feet drab-grey above. Tail proportionally rather long, drab-grey.

Skull rather larger than that of *P. potto*; nasals of about the same length, longer than in *P. ibeanus*. Postorbital bar about as in *P. batesi*, broader than in *potto*, narrower than in *ibeanus*.

Teeth small throughout, very much as in *P. ibeanus*, except that m^2 is fully equal in size to m^1 . P^2 similarly two-thirds the height of the canine and longer than the teeth following it, and below the same. (There is an extra premolar on each side above in the type between the anterior premolar and p^3 , but this would certainly appear to be abnormal.) In *P. potto* p^2 is but little larger than p^3 above, and is smaller than it below. The molars are also even smaller.

Dimensions of the type:—

Head and body 355 mm.; tail 75; hind foot 77; ear 25.

Skull: upper length 66; basal length 58; greatest breadth 47; nasals 17; upper cheek-tooth series 17.8; molars only 9; breadth of m^2 4.1.

Hab. Southern Nigeria.

Type. Adult male. B.M. no. 2. 7. 12. 1. Presented by the Zoological Society, to whom it was given by Edward Straw, Esq. Lived in the Zoological Gardens, May 26th to June 17th, 1902.

The Pottos fall readily into two groups, large-toothed and small-toothed. The former are *P. edwardsi* and *batesi*, the latter *P. potto*, *ibeanus*, and the present form. From *P. ibeanus* *P. ju-ju* is distinguished by its uniform colour and widely different locality; from *P. potto* (of which the Museum contains one almost topotypical specimen) by its drab-grey instead of dark brown colour and by the different proportions of its premolars. The special characters of the Sierra Leone *P. geoffroyi*, Benn., are unknown to me, but it obviously cannot be the same as *P. ju-ju*.

Tatera guineæ, sp. n.

Allied to *T. kempi*, Wr., but smaller.

External proportions and colour quite as in *T. kempi*, except that light patches are present behind the eyes and the tail is rather more tufted, the hairs of the tuft 7-8 mm. in length.

Skull in its general shape quite like that of *T. kempi*, but smaller throughout. Posterior palatine foramina lengthened. Bullæ markedly smaller than in *kempi*, larger than in *gracilis*.

Dimensions of the type (measured in the flesh) :—

Head and body 160 mm. ; tail 172 ; hind foot 36 ; ear 21.

Skull : greatest length 38·6 ; basilar length 29 ; nasals 15·5 ; interorbital breadth 6·4 ; palatilar length 17·6 ; greatest horizontal diameter of bulla 10 ; upper molar series 6·5.

Hab. Ginnal, Portuguese Guinea. Alt. 50 m.

Type. Adult male. Original number 37. Collected 19th July, 1909, by Dr. W. J. Ansorge. Four specimens.

This species is as readily distinguishable from *T. kempi* by its smaller size and smaller bullæ as from *T. gracilis* by its larger size and larger bullæ. The greatest horizontal diameter of the bullæ in the types of the three species is 8·7, 10, and 11 mm. respectively.

Arvicanthis ansorgei, sp. n.*A. rufinus* group.

General characters of *A. rufinus* and *occidentalis**, size intermediate between the two. Character of fur and colour as in *A. rufinus*, the area round the base of the tail strongly suffused with tawny.

Skull slender, its outlines more like those in the larger *rufinus* than in the smaller broader-skulled *occidentalis* ; nasals long and slender, evenly tapering backwards ; interorbital region narrow ; distance between parietal ridges less than in the smaller *occidentalis* ; interparietal very small, narrow antero-posteriorly. Bullæ a little larger than in *occidentalis*, much smaller than in *rufinus*.

Incisors narrow for this group, not even so broad as in the smaller *A. occidentalis*, of which the type is younger than that of *ansorgei*. Molars slightly larger than in *occidentalis*, but all three species, widely as they differ in general size, have the molars of approximately the same dimensions.

* Cf. Wroughton, Ann. & Mag. Nat. Hist. (7) xvii. pp. 376-377 (1906).

Measurements of the type :—

Head and body 160 mm.; tail 125; hind foot 33; ear 20.

Skull: greatest length 34·5; basilar length 28·2; nasals 13·3 × 4·6; interorbital breadth 4·8; breadth across parietal ridges 11·2; breadth of brain-case 14; palatal foramina 7; diastema 9·2; palatilar length 16; length of bullæ 6·8; upper molar series 6·8.

Hab. Gunnal, Portuguese Guinea.

Type. Adult male. Original number 49. Collected 28th July, 1909, by Dr. W. J. Ansorge.

XLVIII.—*The Caudal Fin of the Elopidae and of some other Teleostean Fishes.* By C. TATE REGAN, M.A.

(Published by permission of the Trustees of the British Museum.)

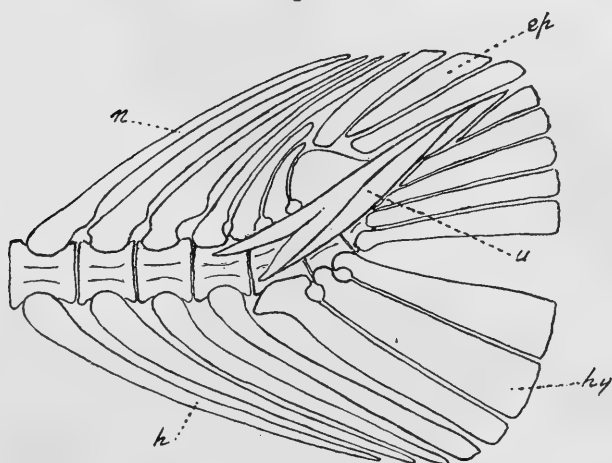
IN the Jurassic and Cretaceous fishes of the family Oligopleuridae (*Oligopleurus*, *Spathiurus*, *Oenoscopus*) the caudal fin was symmetrical in form but structurally heterocercal; the terminal portion of the vertebral column was rather gently inclined upwards, the centra continued right to the bases of the fin-rays, and a notochordal prolongation, perhaps invested with cartilage, separated the epaxial and hypaxial rays, which were sharply differentiated; the series of spinous epaxial rays comprised anterior rays which increased in length backwards, and shorter posterior rays; the former bent forward below and were supported by a few (not more than 4 or 5) basalia, whilst the rest were inserted on the notochord or behind its termination on the uppermost hypaxial ray; the hypurals were numerous and but little expanded.

In the Pholidophoridae the structure appears to have been essentially similar, but the Leptolepidae were different and had a caudal fin like that of the living Elopidae.

In *Elops* (*affinis*, *machnata*, and *lacerta*) and *Megalops* (*atlanticus* and *cyprinoides*) the upturned portion of the vertebral column is shorter and more abruptly inclined upwards than in the Oligopleuridae, and includes only three centra; the last centrum is remote from the bases of the fin-rays, and indeed the notochordal prolongation only separates the lowest epaxial and uppermost hypaxial rays basally, terminating in an opisthural cartilage. The posterior neural arches, crowded together by the abrupt upturning of the vertebral column, have taken on the function of strengthening

the upturned vertebræ, thus replacing and inducing the abortion of the posterior centra; these neural arches have become enlarged and have shifted their proximal attachments downwards and forwards; one is united by suture with the centrum of the third last vertebra, and usually appears forked at the base, the anterior fork running forward to the centrum of the fourth last vertebra; the forking indicates the compound nature of this bone, and in some specimens the line of junction between the two component elements can be clearly seen; another bone is united to the posterior edge of the one just described, and is prolonged upwards above it, and this is

Fig. 1.



Skeleton of caudal fin of *Elops* (somewhat diagrammatic).

n, neural spines; *ep*, epaxial basalia; *u*, uroneurals; *hy*, hypurals;
h, hæmal spines.

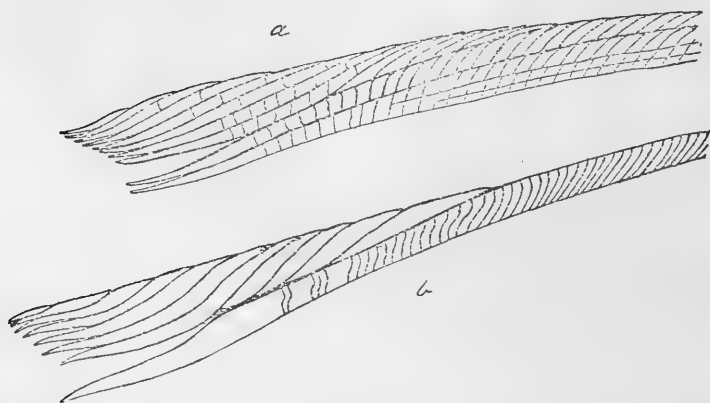
also composed of two, the suture between which may persist, so that we are here dealing with at least four posterior neural arches, which I propose terming 'uroneurals'; these are to be regarded as pertaining to centra which have aborted, and thus correspond to the posterior hypurals. The neural arch of the actual last vertebra is expanded to form a plate, and the shape and position of this and of the one or two arches in front of it appear to be determined by the room required by the epaxial basalia, now three in number. There are nine hypurals or expanded hæmal spines, and three more hæmal spines also support the caudal fin.

Leptolepis seems to have been exactly like *Elops*, but in some species of *Thrissops* a series of no less than six separate uroneurals can be seen.

The caudal fin skeleton of the Clupeidæ, which has recently been described and figured by Mr. R. H. Whitehouse (Proc. Roy. Soc. B. lxxxii. p. 139), differs from that of the Elopidae in that the last two centra have aborted, and the anterior uroneural is ankylosed with the actual last centrum (corresponding to the third last of the Elopidae).

As the Clupeidæ appear to be the most generalized Teleosteans examined by Mr. Whitehouse, I may mention the

Fig. 2.



Epaxial rays, with proximal portions of one or two upper hypaxial rays, of caudal fins of *Megalops*.

a. *M. cyprinoides*, from a specimen of 320 mm.

b. *M. atlanticus*, from a specimen of 1800 mm.

Albulidæ, Alepocephaliidæ, Salmonidæ, Osteoglossidæ, Eso-cidæ, Umbridæ, and Anopliidæ as agreeing with the Elopidae in having upturned centra, and in the persistence of the anterior uroneural as a distinct bone.

The Elopidae show some features of interest in the arrangement of the caudal fin-rays, for, as will be seen from the accompanying figures, both species of *Megalops* resemble the Oligopleuridæ in that the epaxial rays are divided into an anterior and a posterior series, the former supported by neural spines and basalia, the latter inserted on the uppermost hypaxial ray. These epaxial rays appear to be usually more

numerous in the adult than in the young and to increase by development of rays posteriorly; in large adult Tarpon (fig. 2 b), 1500 to 1800 mm. in length, I count from two to four inserted on the uppermost hypaxial ray, but in young examples (300 to 400 mm.) one or two. The young differ from the adult fish also in that the articulations of the principal caudal rays are far less numerous; but the anterior epaxial rays do not increase in size at anything like the same rate as the hypaxial rays, and are relatively much larger in the young, so that the longer of them are articulated in the young, but, from their more proximal position, spinous in the adult. In adult *Megalops cyprinoides* (300-350 mm.) the posterior epaxial rays vary in number from six to nine. These posterior epaxial rays or "funeral spines" are wanting in *Elops* and in all other homocercal fishes, but the anterior epaxial rays persist in most and are usually articulated, so that we appear here to have a case of the reconversion of spines into articulated rays.

In the Elopidae the principal caudal rays (*i. e.* all the hypaxial rays except the lower graduated ones) are 19 in number, and 17 of these are branched. This seems to be the case in a large number of families, *e. g.* the Leptolepidæ, Chanidae, Albulidae, Salmonidae, Clupeidae (except *Coilia*), Esocidae, Aulopidae, Cyprinidae, Berycidae, Lampridae. In the Serranidae, Sparidae, Carangidae, &c., the number appears to be constantly 17 (15 branched), and in various more specialized groups is still further reduced. Without laying too much stress on this character, I may say that I have found it of considerable value in determining the affinities of some types of doubtful systematic position.

In *Elops*, but not in *Megalops*, there is an oblong bony scale above and below, partly covering the first upper and lower rays; this was present in the Leptolepidæ, and persists in *Albula*, *Aulopus*, and some Clupeids.

I have already mentioned Mr. Whitehouse's paper on the caudal fin of fishes, and I have shown that the element which he terms "urostyle" in *Clupea* is formed by one or more displaced posterior neural arches or "uroneurals"; the homocercal fin should not then be defined by the presence of a urostyle formed by the fusion of upturned vertebrae, but by the modification of posterior neural arches into uroneurals which functionally replace and so lead to the suppression of the centra of the upturned vertebrae. There are some other points which call for comment; thus I think the term "epaxial basalia" preferable to and more correct than "dorsal caudal radials," and I cannot agree that *Fierasfer* is "gephyrocercal."

It is evident from Ryder's definition of "gephyrocercy" that this term will have to be restricted to the Molidæ, where the posterior part of the tail seems to have aborted and the interval between the dorsal and anal has become bridged across (*γέφυρα*, bridge) by a secondary formation of rays, inserted on basalia and derived from the dorsal and anal fins. In a number of eel-shaped fishes the dorsal and anal fins are confluent with the caudal, which becomes progressively reduced as the tail gets longer and the vertebræ and dorsal and anal fin-rays increase in number. The Ophidioids are fishes of this type; in *Genypterus* the last vertebra is slightly expanded posteriorly into two hypurals, one of which bears four and the other five rays, the remnant of the caudal fin. Emery's figure of *Fierasfer dentatus* shows a condition somewhat more specialized than in *Genypterus*; there is no definite hypural expansion and the last vertebra is almost like the one in front of it, but without neural spine; the caudal rays, distinguished by the absence of basalia, are now only six in number. *F. acus* appears to differ in that the caudal fin has disappeared, whilst the end of the tail projects beyond the dorsal and anal, as in the Ophichthyid eels.

XLIX.—*An interesting Structural Analogy.*

By AUSTIN HOBART CLARK.

EVERY ornithologist is aware of the fact that in the winter the Ruffed Grouse (*Bonasa umbellata*) and related species are enabled to tread upon the loose surface of newly fallen snow without sinking down into it, through the seasonal development of the so-called "snow-shoes," which greatly increase the area covered by the soles of the feet. These "snow-shoes" are composed of two rows of scutes on either side of each toe—the first row, adjoining the median scales, similar to them and more or less squarish; the second row smaller, elongate-oblong, and projecting laterally outward when the foot is on the ground, downward and slightly forward when the foot is raised. The area covered by each foot of the Ruffed Grouse in the winter, therefore, is equivalent to the area covered in the summer plus the area covered by these lateral scutes, or about as much again. Thus a bird walking about in the winter brings to bear only half as much weight in any given spot as the same bird in the summer, and is

thereby enabled to tread securely upon lightly compacted snow.

The problem of walking safely upon the yielding surface of snow has been solved by grouse as by man—by a large increase in the supporting area brought into contact with it.

Among that interesting group of marine animals known as the Crinoidea a very similar problem has been solved in a strikingly similar way. The Crinoidea are dependent for their food upon small organisms which fall upon their up-turned and outstretched arms and pinnules, and are thence conducted by means of a ciliated "ambulacral groove" to the mouth. It is at once evident that if the lateral area of the very slender pinnules can be increased in any way, the number of falling food-particles intercepted, and hence the available food-supply of the animals, will be proportionately increased—the same question arising in regard to the presentation of a maximum food-collecting surface directed toward the rain of food from above among the crinoids as arose among the grouse in reference to the development of a maximum area of support upon a loosely compacted surface. In the crinoids, as in the grouse, two rows of supplementary plates on either side of the single median row have been developed, the first row of squarish plates, the outer of elongate rounded plates, extensible laterally, but capable of being folded inward over the delicate ambulacral groove, so as to serve as a protection to it, an additional service not required in the outer series of scutes in the grouse.

I have been unable to find in the literature any account of the origin of the scutes in the grouse; but Dr. Stejneger has suggested to me that they are in all probability merely modified feathers, a derivative from some such condition as that found in the Red Grouse (*Lagopus scoticus*) or Ptarmigan (*Lagopus mutus*). In the crinoids these two rows of supplementary plates are formed directly from the pinnule segments; the distal angles of these expand and project in the form of thin rounded flange-like processes, which eventually become separated off from the pinnule segments by suture. In some groups there is no further development; but in others the distal outer angles of the plates of these newly formed rows ("side-plates") become expanded, and these again become separated off from the parent plates by suture, forming the second row of laterally extensible rounded plates ("covering-plates").

Now it has been found that, as a rule, these side- and covering-plates are much better developed and of far more

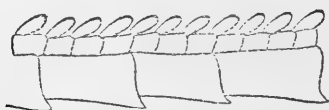
general occurrence in the crinoids of the deeper waters than in those of the shore-line, and, as they and more or less similar structures are of quite general occurrence among fossil forms, the crinoids of the deep sea have been considered more primitive than those of shallow water. But the question of the development or suppression of side- and covering-plates is susceptible of a much more logical explanation. The crinoids of the deeper levels must depend for their food upon the rain of minute dead organisms from above; few, if any, small organisms live among them; the littoral crinoids, on the other hand, are surrounded by multitudes of living microscopic animals which they intercept by means of their arms and pinnules, and can derive little or no benefit from dead ones, as, aside from the fact that there are comparatively few of them, they are undoubtedly promptly devoured by

Fig. 1.



The scutes of the middle toe of a specimen of *Bonasa umbellatus*, shot in November.

Fig. 2.



A portion of a pinnule from a crinoid belonging to the family Thalassometridæ, showing the side- and covering-plates bordering the pinnulars.

other small predacious organisms, such as the minute crustacea or the bacteria. While a dead animal falling upon the upward slanting extended covering-plates would roll down them into the ambulacral groove, where it would come within reach of the cilia, a living animal on coming in contact with these plates would instantly back away, as *Paramecium* does on encountering the sides of a glass dish. Thus any increase in pinnule area resulting from the formation of laterally extensible plates, while of the very greatest service to species inhabiting water where only dead organisms are available, would not be of the slightest use to species existing in the

midst of active living organisms. I believe that this is the real reason for the development of side- and covering-plates in the crinoids of the deeper waters, and for their suppression or non-existence in littoral forms and in pelagic forms like *Uintacrinus*; and this idea is further borne out by the fact that shallow-water species belonging to normally deep-water groups having large side- and covering-plates have these but feebly developed, while deep-water species belonging to groups ordinarily inhabiting shallow water, and devoid of these plates, are commonly found to possess them. As an instance of the former case may be mentioned *Ptilometra macronema* (J. Müller), of the latter *Comatilia iridometri-formis*, A. H. Clark, or *Nemaster iowensis* (Springer).

L.—*Descriptions and Records of Bees.*—XXVII.

By T. D. A. COCKERELL, University of Colorado.

Greeleyella resinata, sp. n.

♀.—Length 8–8½ mm.

Black, with scanty pale pubescence, tinged with yellowish above; mesothorax and abdomen shining; hind tarsi (except for the hair) dark; flagellum variably reddish beneath; first r. n. meeting first t.-c., or entering basal corner of second s.m. Very closely related to *G. beardsleyi*, Ckll. (syn. *Panurginus malvastri*, Sw. & Ckll.), but differing as follows:—A trifle smaller; abdominal segments beyond the first, instead of being smooth, with small punctures, have the surface microscopically transversely striate; scutellum with a slight median groove or depression; tegulæ darker and smaller; anterior tibiæ &c. not pallid in front.

Hab. Lee County, Texas (*G. Birkmann*); four females, sent by Prof. C. F. Baker (no. 7107).

Halictoides ilicifoliæ, sp. n.

♂.—Length 5½ mm. or a fraction more.

Black, with greyish-white pubescence; wings hyaline, nervures and stigma dark fuscous; mandibles with the apical half ferruginous, the cutting-edge rather broad, notched; head broad, eyes strongly converging below; face with much white hair; antennæ short for a male, dark, flagellum obscurely reddish beneath; head and thorax shining, the base

of metathorax smooth and very brilliant; tegulæ shining reddish brown; abdomen broad, like that of a female, delicately but evidently punctured, the hind margins of the segments ferruginous; apex covered with white hair. The following characters are ascertained with the compound microscope:—Third and fourth antennal joints very short; apical joint with an oblique flat shining face; the six-jointed maxillary palpi short and stout, but still extending beyond the blade of maxilla, which is short and broad, very obtusely rounded apically; front strongly punctured; claws deeply cleft, pulvillus very large. The wings are quite clear; the venation differs from that of *H. tinsleyi*, Ckll., by the shorter second s.m., with the first r. n. entering very near its base, and the b. n. falling a considerable distance (about $65\ \mu$) short of t.-m. The labial palpi are short, with first joint not nearly so long as the other three together. The tongue is very short.

Hab. Santa Clara County, California, at flowers of *Prunus ilicifolia* (Nuttall); four males (*C. F. Baker*, 7109).

This remarkable bee is so distinct from genuine *Halictoides* in its mouth-parts that it must stand as the type of a new genus or subgenus, which may be called *Amblyapis*.

AMBLYAPIS, gen. v. subgen. nov. (type *ilicifoliae*).

Maxillary palpi 6-jointed, stout, with very short bristles, mostly at end of joints; length of joints in μ :—(1) 135, (2) 100, (3) 85, (4) 75, (5) 68, (6) 100; last joint slender; blade of maxilla about $425\ \mu$ long and 220 broad, thus very short and wide, subtriangular, very obtuse at end, with long bristles; maxillary comb with about five short teeth.

Labial palpi 4-jointed, very short, joints measuring in μ : (1) 100, (2) 85, (3) 68, (4) 85. The extraordinary feature of these palpi is in the second and third joints, which have one side heavily chitinized, forming a sort of sheath, which is produced outwards to a bristly point. Paraglossæ very short; tongue extremely short. The striated muscle which operates the tongue and adjacent organs is extremely coarse, the striæ only about five in $37\ \mu$ of length.

In *Halictoides tinsleyi* the blade of maxilla is divided longitudinally into two parts, the outer, which is shorter than the inner, having a width in middle of $68\ \mu$, and being wholly without bristles or markings. In *Amblyapis ilicifoliae* this outer part is much reduced, about $50\ \mu$ wide towards the base, but rapidly tapering and coming to a point about $170\ \mu$ before the end of the blade. In *H. dentiventris*, Nyl., the

type of *Halictoides*, the condition of the blade is essentially as in *H. tinsleyi*. In *H. paradoxus*, Moraw., the outer portion is also well developed, ending obtusely $187\ \mu$ before the rather narrow apex of the blade, which bears very long bristles. In *Dufourea vulgaris* the blade is narrow, with long bristles. The bipartite condition of the maxillary blade is very strongly developed in *Halictus*, e. g. *H. sisymbrii*, Ckll., and *H. armaticeps*, Cresson, and the European *H. virescens*. In *Melitta leporina* there is no sign of it. In *Pseudopanurgus aethiops*, Cress., the outer or subhyaline area is present and tapers apically as in *Amblyapis*. In *Nomia nortoni*, Cress., the outer area is present, but narrow (about one-ninth total width of blade) and tapering. In *Dasypoda plumipes* it is reduced to an inconspicuous subhyaline margin, broadening basally, where its width is about one-fifteenth that of the blade.

Agapostemon texanus iowensis, subsp. n.

♀.—Similar to *A. texanus*, Cresson, but rather small (anterior wing $7\frac{1}{2}$ mm.); mesothorax, while showing the double puncturation of *texanus* quite distinctly, much rougher, the smaller punctures more crowded; metathorax with the basal triangle distinctly defined by raised lines, but the sculpture coarser than in subsp. *subtilior*, Ckll.; abdomen broader than in *A. radiatus*.

Hab. Ames, Iowa, 1899 (*Wilmon Newell*).

Possibly a hybrid with *A. radiatus*. The abdomen is without evident hair-bands; in *subtilior* these are very distinct.

Anthidium subochraceum, Walker, 1871.

This species, from Mount Sinai, was very poorly described by Walker, and has never been recognized since. I examined the type at the British Museum, and am able to add the following particulars:—Front down to clypeus black, except for a red band below middle ocellus and the broad (narrowing at summit) yellowish-ferruginous bands next to orbits; mandibles 4-dentate; hair of head and thorax above strongly fulvous; punctures of abdomen rather large. Wings reddish, apical region suffusedly darker; stigma ferruginous. Legs ferruginous shaded with orange; apparently no pulvilli. Abdomen above dark reddish, with the bases of the second and following segments broadly and suffusedly blackened, the hind margins of the segments a sort of pale orange; scopa white; second r. n. going beyond second s.m.; scutellum

with hind edge projecting, sharp, emarginate in middle; axillæ obtusely angulate. The abdomen is wholly without yellow or white lands, but the base of the sixth segment shows obscure pallid spots alternating with dark ones.

Appears to be related to *Dianthidium ferrugineum* (Fabr.).

Eucera cinerascens, Walker, 1871.

Another unrecognized species. I have not seen the male type, but a female from the convent garden at Mount Sinai, which Walker thought probably conspecific, is an *Anthophora*. It is in wretched condition, with matted hair; clypeus black, with a keel or ridge on its upper two-thirds in the median line; labrum with a pair of basal yellowish spots.

Tetralonia spoliata, Walker, 1871.

Also unknown to recent writers. Walker's female from Mt. Sinai is in bad condition; hair of head and thorax above badly matted, but appears to have been deep fulvous; clypeus all black, densely and coarsely punctured; abdominal bands yellowish, hind margin of first segment rather broadly rufous; wings not dark. Comparison with Walker's description shows that the latter is inaccurate as well as too short.

Cœlioxyys philippensis, Bingham, 1895.

I have examined the male type. Anterior wings dark fuscous, shining violaceous; head and thorax with extremely large punctures; abdomen 8-dentate. Easily recognized by the first abdominal segment being dorsally covered with fine moss-like white tomentum.

Halictus dybowskii, Rad., 1877.

A female in the British Museum is one of those collected by Dybowski. It is a large black species, very shiny, with large strongly *tridentate* mandibles. Head large, face very broad; clypeus sparsely punctured; area of metathorax plicatulate, *its apical part transversely wrinkled*; apical truncation of metathorax with the lateral marginal keels going about halfway up; anterior wing $9\frac{1}{2}$ mm.; wings dusky, venation normal; hind spur very finely denticulate, the denticles minute, short, and numerous; abdomen with no apical hair-bands, but some basal pale pubescence.

Halictus flavovittatus, W. F. Kirby.

I have examined the female type from Socotra. It is a true *Halictus*, with normal venation, but remarkable for the character of the abdomen, the segments very black, with the margins narrowly ivory-colour, without hair-bands. Area of metathorax large, granular-striatulate; hind spur minutely short-ciliate. *H. vittatus*, Smith, from the Cape of Good Hope, has similar tegumentary bands, but it is not so large, and the bands are light yellow, the first quite golden yellow. The specimen examined, in the British Museum, is marked *vittatus*, variety.

Halictus niloticus, Smith, 1879.

The type, a male, is a green insect with a curious large head, and a peculiar thing is that the upper ends of the eyes are green. There is a large yellow spot on lower part of clypeus.

Halictus farinosus, Smith.

Rim Rock, Sandia Mountains, New Mexico, at flowers of *Frasera*, 1 ♂ (*J. R. Watson*). New to New Mexico.

COLLETES.

The following table for the separation of some little-known species was prepared at the British Museum. The Radoszkowski species should be authentic, as they were received from the describer:—

Very small, anterior wing 5 mm.: densely covered with white hair; bases of abdominal segments, where exposed, densely punctured; nervures and stigma pale ferruginous; second s.m. broad, receiving r. n. in middle; posterior face of metathorax covered with hair. ♂. (Askabad.)		<i>askhabadensis</i> , Rads.
Larger, not thus hairy; malar space in no case long	1.	
1. Thorax above covered with short pale ochreous moss-like hair, like the American <i>C. aberrans</i> , Ckll.; anterior wing 7 mm. long; abdomen with broad bands of greyish-white tomentum, the first segment densely and coarsely punctured, second densely and finely, in strong contrast; nervures and stigma dark, paler basally; antennæ very short. ♀. (Askabad.)		<i>carinatus</i> , Rads.
Thorax with normal pubescence	2.	

2. Hair fringing thoracic dorsum, and on each side of antennæ, fox-red; size ordinary. Hair of sides of metathorax and of pleura greyish white; abdomen, when fresh, with narrow white hair-bands, very conspicuous, on hind margins of segments 2 to 5; mesothorax in middle nude, shining, with scattered large punctures; second s.m. very broad, much broader above than third; first abdominal segment with punctures very much larger than on second; hind spur strongly ciliate; antennæ short.
 ♀ *sidemii*, Rads. (*jankowskyi*, Rads., is a synonym, if the specimen so labelled is authentic).
- Hair of thorax &c. not so coloured 3.
3. Size smaller, length about 9 mm.: no dark hair on head or thorax; abdomen with broad bands of yellowish-white tomentum; hind margin of first segment (tegument) rather broadly reddish; tegulæ very pale reddish; antennæ short; clypeus sparsely punctured in middle; nervures and stigma rather dark; hind spur very minutely ciliate.
 ♀ *mirtus*, Rads.
- Larger, with some fuscous hair on thorax above 4.
4. Abdomen dull, first segment granular, not punctured; anterior wings dilute fuliginous; flagellum ferruginous beneath except at base *dudgeonii*, Bingham.
- First abdominal segment well punctured. 5.
5. Abdomen very shiny, pyriform, first segment relatively weakly punctured, though very distinctly, its hind margin ferruginous; wings yellowish. (Japan.)
 Abdomen duller, first segment strongly and coarsely punctured, its hind margin not reddened, but covered, as also base of second segment broadly and apices of segments 2 to 5, with greyish-white hair; face broad. ♀ *perforator*, Smith (type).
- *gallicus*, Rads.

The example of *C. dudgeonii* appears to be correctly named, although it is from the Bombay district, and has anterior wings quite strongly fuscous. It is 13 mm. long; clypeus and front densely punctured; tegulæ very dark brown; abdomen dull, not punctured.

Diadasia afflictula, sp. n.

♂.—Length about 7 mm., width of abdomen $2\frac{1}{3}$.

Runs in my table ('American Naturalist,' xxxix. p. 743) to *D. afflicta*, Cresson, to which it is in every way very closely related, differing in the much smaller size and slender abdomen. Tegulæ rather light ferruginous; second submarginal cell much contracted above; hair of thorax above and pubescence generally very pale ochreous. I had this mixed with *D. diminuta*, from which it is easily known by the short black or dark fuscous hair on the abdominal segments beyond the second, of course not involving the broad apical fringe. The hair of the apical fringes is appressed, not erect as in *D. skinneri*, Ckll., which also differs greatly by its short broad abdomen.

Hab. Mesilla, New Mexico, May 1 (*Cockerell*).

Pseudopanurgus cameroni (Baker).

Pasiphaë cameroni, Baker, Invertebrata Pacifica, i. 1906, p. 141.

I am greatly indebted to Professor C. F. Baker for the loan of one of the original types. The b. n. falls short of t.-m. a distance nearly equal to length of second s.m. on first discoidal.

Xenoglossa crawfordi, sp. n.

♂.—Length about 21 mm. (difficult to measure, the abdomen being curved downwards and inwards); anterior wings about 14 mm., width of abdomen $7\frac{1}{2}$.

Black, including the legs, the hind margins of the abdominal segments (except the first) broadly semitranslucent coppery red; clypeus lemon-yellow, with its upper margin broadly black and its lower ferruginous; greater part of mandibles yellow; labrum pallid, with light brownish hair; face rather narrow, eyes very large, converging above, ocelli very large; hair of face pale brownish, whitish at sides near clypeus, of cheeks below rather dull white, of vertex reddish sooty; antennæ black, only moderately long, last eight joints with obscure reddish spots, third joint longer than fourth, but not as long as 4 and 5 together; mesothorax and scutellum dull, densely minutely punctured; thorax above with hair light ochreous, pleura with the same, but paler, but metathorax with it very dark chocolate-brown, except a tuft of ochreous in the middle of the basal area; hair of legs dark chocolate, pale ochreous on anterior femora behind and to some extent pallid on middle femora; tegulæ piceous, punctured; wings dark fuliginous; abdomen with hair of first segment and

middle of base of second very dark fuscous, beyond this it consists of short dense warm ochraceous tomentum; apical plate (seventh segment) extremely broad, with a keel on each side; venter with dark hair. The structure is essentially as in *X. fulva*, Smith, including the venation.

Hab. Guadalajara, Mexico (*D. L. Crawford*, 7106).

Received from Prof. C. F. Baker.

Nomada vicinalis aldrichi, subsp. n.

♂.—Runs in the table of Rocky Mountain *Nomada* (Bull. 94, Colo. Agr. Exp. Sta.) to *N. vicinalis*, Cresson, to which it is very closely related, differing as follows:—Upper margin of clypeus more or less black; scape swollen; mesothorax wholly black; scutellum black, with a pair of variable (large or small) red spots; hind femora with more black; basal part of area of metathorax strongly wrinkled. From *N. vicinalis infrarubens*, Ckll., it differs by the hair of thorax above only slightly brownish; scutellum and mesothorax as just indicated; first abdominal segment with a broad entire red band. The lateral face-marks, clavate above, are much as in the supposed male of *N. cymbalariae*, Ckll., but the scape is much stouter than in the latter, which is, however, very closely allied. The venter of the abdomen is red, with a heart-shaped black mark on first segment, a black band at base of second, and a large yellow spot on apical segment; these markings vary from distinct to obscure. The apical plate is broad, hairy, and notched. The b. n. goes basad of the t.-m.

N. subaccepta, Ckll., is also related, but differs from *aldrichi* by its more prominent red scutellum, comparatively slender scape, &c.

The chrome-yellow markings of the abdomen are more reduced than in true *vicinalis*. On the second segment they are very large; on the third variable, from large to very small; on the fourth and fifth reduced or obsolete; on the sixth well developed and confluent.

Among Robertson's Illinois species it is nearest to *N. illinoensis*, Rob., which is a considerably smaller insect. The female, when discovered, will doubtless prove to have the head and thorax red.

Hab. Moscow, Idaho; two males in Philadelphia Acad. Nat. Sci., "deposited by Wm. J. Fox."

The insect is named after the well-known entomologist of Idaho.

Nomada modocorum, Ckll.

Pasadena, California, April 6 (*Grinnell*). New to California.

On May 29 Mr. Grinnell took *Halictus catalinensis*, Ckll., at Pasadena, showing that it is not confined to Catalina Island.

LI.—*Two new African Shrews.*

By WILFRED H. OSGOOD.

As a further result of studies at the Natural History Museum two new shrews of the genus *Crocidura* have been found, which, like the rodents described in the March number of the 'Annals,' are named at the instance of Mr. Oldfield Thomas. Both are given subspecific rank, not only to indicate their positions in the large and unrevised genus to which they belong, but also because experience with groups more completely known has shown that closely related continental forms are more often proved to be connected by gradations than otherwise.

Crocidura bicolor elgonius, subsp. n.

Type from Kirui, near Mt. Elgon, British East Africa. Subadult female. Collected Sept. 5, 1909, by R. Kemp. Original number 198. Rudd Collection.

Characters.—Allied to *Crocidura bottegi* and *C. bicolor cunningghamei*; general colour more sooty than in either; upperparts brownish mouse-grey, the tips of the hairs only slightly paler than the bases; underparts pale smoke-grey; feet sooty, somewhat lighter laterally; tail sooty above, slightly paler below. Skull small and flat, with teeth decidedly smaller than in *cunningghamei*, slightly larger than in *bottegi*; skull more elongate and brain-case flatter than in *bottegi*.

Measurements.—Type and one topotype, respectively: total length 90, 97 mm.; head and body 52, 55; tail-vertebræ 38, 42; hind foot (s. u) 9, 9. Skull of type: condylo-incisive length 16.6; breadth of brain-case 7.4; maxillary breadth 4.8; upper tooth-row 7.5; length of molariform series 3.9; i^1 to pm^4 3.53; width of m^2 1.75.

Remarks.—The general blackish coloration of this form readily distinguishes it from its allies. *C. bottegi* is a smaller form, entirely brownish in colour, while *cunninghamei* is slightly larger, with brownish upperparts and with the feet practically white instead of chiefly sooty. Typical *bicolor*, as represented by specimens from Angola, is much paler, with practically pure white underparts.

Crocidura flavescens kivu, subsp. n.

Type from Lake Kivu, Eastern Congo. No. 7. 6. 14. 24, British Museum. Adult male. Collected Nov. 30, 1906, by D. Carruthers. Original number 319.

Characters.—Similar to *Crocidura f. nyansæ*, but much darker coloured; upperparts a rich shade of brown somewhat between the vandyke brown and the burnt umber of Ridgway; underparts a dark but rather lively russet; feet and digits entirely blackish brown, as dark as or darker than the upperparts; tail entirely blackish. Skull practically as in *doriana* and *nyansæ*.

Measurements.—Type: total length 198 mm.; head and body 110; tail-vertebræ 88; hind foot (s. u.) 19. Skull of type: condylo-incisive length 30·8; breadth of brain-case 12·4; maxillary breadth 9·15; upper tooth-row 14·1; i^1 to pm^4 7; length of molariform series 7·5; width of m^2 3·4.

Remarks.—This appears to be the most richly coloured form of the *flavescens* group yet known. *C. f. nyansæ* is much lighter coloured, and in this respect stands in a position somewhat between the present form and *C. f. doriana* of Abyssinia. Specimens from Entebbe and Mumias, localities respectively east and west of the type locality, have been used to represent *nyansæ*. *C. f. anchietæ* of West Africa is doubtless closely allied, but is described as being “d’un gris fauve en dessous.”

LII.—*List with Notes on some Land-Shell*s from the Island of Muswar, Dutch New Guinea, and Descriptions of new Species and Varieties of *Planispira* (Cristigibba), *Papuina*, *Calycia*, and *Leptopoma*. By HUGH C. FULTON.

THE shells noted herewith were collected by Messrs. C. and F. Pratt (sons of the well-known collector A. E. Pratt) on Muswar Island, Geelvink Bay.

Xesta citrina, Linn.

Two varieties, one with lemon-coloured ground with a dark brown band on periphery of last whorl, the other dark brown above with a still darker band at periphery of last whorl, which is sharply contrasted by a white band below, the remainder of underside being of a glassy white colour.

Chloritis cheratomorpha, Tapp.-Canefri.*Planispira (Cristigibba) dolens*, Fulton, sp. n.

Shell subcircular, with deep umbilicus about 2 mm. wide at upper part, white, smooth and polished, subtransparent, with a very narrow reddish-brown band at suture of upper whorls descending to edge of peristome and situate on last whorl just a little above the periphery (where it is about 1 mm. in width); spire almost flat, apex being slightly depressed; whorls $4\frac{1}{4}$, last descending about 2 mm.; peristome white, moderately expanded, margins joined by thin callus; aperture subovate, very oblique; constriction at rear of peristome very slight.

Maj. diam. $21\frac{1}{2}$, alt. 10 mm.

Hab. Muswar Island, Geelvink Bay, Dutch New Guinea.

Similar in form to *wahnesi*, Fulton, but flatter and thinner, with smaller aperture and different coloration.

Thinner and more circular in form than *cornicu'um*, H. & J.; the aperture is smaller and the peristome not so widely expanded. Compared with *papuana*, Mlldff., and *semirasa*, Marts., it is larger, not so flat, and not nearly so strongly constricted at rear of aperture.

Papuina antiqua, Ad. & Rve. (= *leonardi*, Canefri) (= *horderi*, Sowb.).

This is a very variable species in form and coloration; the two specimens received from Muswar Island are of a uniform light brown or fawn colour.

Papuina grata, Michelin, var. *magna*, Fulton, var. nov.

Maj. diam. 33, alt. 25 mm.

The Muswar Island specimens are much larger than typical *grata* and densely covered with hairs.

I am not sure that the pilose character of this species has been recorded before; the hairs are evidently easily rubbed off.

Papuina hero, Smith.

Papuina pratti, Fulton, sp. n.

Shell pyramidal, narrowly but deeply umbilicated, greatest width of umbilicus under 2 mm.; moderately thick, creamy white, with a narrow reddish-brown band commencing about the third whorl and continued to edge of peristome, almost smooth, lines of growth inconspicuous, irregularly minutely granulated below the last whorl (this character is more or less present on other specimens than type); whorls $5\frac{3}{4}$, convex above, decreasing in convexity below, last sharply keeled, suture of middle whorls slightly marginated; peristome white, rather broadly expanded, especially at columellar portion, very oblique, exterior band showing through the aperture.

Maj. diam. 29, alt. $19\frac{1}{2}$ mm. (type).

Another specimen: maj. diam. $26\frac{1}{2}$, alt. 16 mm.

Hab. Muswar Island, Geelvink Bay, Dutch New Guinea.

This shell belongs to the group of *vitrea*, Fér., and *pseudolanceolata*, Dtz.; it is readily distinguished from the former by its higher spire and its thicker shell, and from the latter by its greater height in proportion to its width, its less expansion of peristome at the keel, and from both by its *less rapidly increasing whorls* and its sutural colour-band.

Papuina rufopurpurea, Mlldff.

This species is very variable in coloration; besides the dark brown typical form the Muswar Island specimens include a variety of a light yellowish-brown ground-colour, with a dark sutural band and pinkish-white peristome.

Calycia crystallina, Rve.

This is a species that varies a good deal in form, and I am convinced that *isselliana*, Tapp.-Canefri, is not separable.

Calycia crystallina, Rve., var. *nigrescens*, Fulton, var. nov.

This variety is similar to typical *crystallina* except that instead of a white ground-colour ornamented with opaque white lines it has a dark brown ground-colour ornamented by numerous white spiral lines.

Maj. diam. 30, alt. 44 mm.

Leptopoma muswarensis, Fulton, sp. n.

Shell globose-conic; narrowly umbilicated, moderately

thin; apex reddish, lower part with a whitish cuticle, ornamented above and below with narrow dark reddish-brown spiral bands, with a broader one just below the periphery; whorls $5\frac{1}{2}$, convex, first two with four or five raised spiral striæ, lower whorls almost smooth, having only numerous close-set microscopical spirals; peristome white, slightly expanded; aperture circular, inner portion showing exterior bands; operculum normal.

Maj. diam. $13\frac{1}{2}$, alt. 14 mm.

Hab. Muswar Island, Geelvink Bay, Dutch New Guinea.

Near *pellucidum*, Grat., but readily distinguished from that species by its dark coloration, especially below the periphery of last whorl; the spirals on the apex of *muswarensis* are stronger, whereas the microscopical spirals on last whorl are weaker than those of *pellucidum*.

This shell also bears a superficial resemblance to the darker coloured specimens of the Bornean *L. sericatum*, Pf., but is easily separated by the absence of raised spirals.

LIII.—Five new Culicidæ from Ashanti.

By F. V. THEOBALD, M.A. &c.

THE five new Culicidæ described here were collected by Dr. Graham in Ashanti. One has to be placed in a new marked genus, which has been called *Pectinopalpus*.

Stegomyia apicoargentea, sp. n.

Head black, with silvery white central spot and white eye-borders; palpi and proboscis deep brown, the former snow-white at apex. Thorax deep brown, with two large round silvery white spots and a small anterior median one; prothoracic lobes white and a small white spot at the base of the wings; pleuræ with white puncta. Abdomen dusky black, last three segments with basal silvery spots, all the segments with basal lateral silvery spots, and the venter with basal white bands. Fore and mid legs with basal creamy bands to metatarsi and first tarsal; hind with an additional band on the second tarsal, and nearly all the third white; femora of fore and mid legs with a white spot below near apex, apex white; in the hind legs base of venter white, and also apex and the tibiæ have a white spot beneath near base.

Length.—4 mm.

Time of capture.—7. viii. 07 and 9. ix. 07.

Habitat.—Obuasi and Kumasi (*Dr. Graham*).

Observations.—Two females, both taken in bush, one at 5 P.M. at Kumasi. Dr. Graham says specimens taken in bush-paths outside Obuasi and outside Kumasi in August and October, from 2 to 5 P.M. Described from a perfect female. The marked thoracic ornamentation and the leg banding combined will at once separate it from all other African *Stegomyia*.

Ædimorphus punctothoracis, sp. n.

Head brown in the middle, black at the sides; proboscis and palpi unbanded. Thorax rich brown, with six silvery white spots; scutellum silvery white. Abdomen dark brown, with basal pale lateral spots. Legs unbanded, apices of tibiæ and femora silvery white.

♀.—Head dark, clothed with flat black scales in front and at the sides with some dull ochreous ones, and white ones at the sides, a patch of narrow-curved dull ochreous ones at the back, and black upright forked scales; proboscis and palpi black; antennæ dark brown, basal segment bright brown with a few small flat scales.

Thorax dark rich brown, with very small dull golden narrow-curved scales, and six spots of small flat silvery white scales; chætæ dark brown; scutellum clothed with flat silvery white scales; metanotum dark brown; pleuræ bright brown, with pale puncta.

Abdomen black, with basal lateral snowy white spots and golden border-bristles; venter mostly dark.

Legs dark brown, venter of femora for the basal two-thirds pale creamy; a snow-white spot at the apex of the femora and tibiæ; chætæ golden; fore and mid ungues equal, unserrate.

Wings with the first fork-cell a little longer and narrower than the second fork-cell, its stem about half the length of the cell, its base nearly level with that of the latter; stem of the second fork-cell about two-thirds the length of the cell; posterior cross-vein not quite its own length distant from the mid.

Length.—2·3 mm.

♂.—Palpi dark brown, hair-tufts dark on the last two segments, the penultimate rather swollen and a little longer than the apical one; antennæ plumose, plume-hairs brown. Fore ungues unequal, the larger with a large tooth, the

smaller with a small one near the base ; mid very unequal, simple ; hind equal and simple.

Wings with the fork-cells shorter than in female, of nearly equal length ; their stems nearly as long as the cells, posterior cross-vein about its own length distant from the mid.

The male claspers are very marked, being bifid.

Length.—2.3 mm.

Habitat.—Accra (*Dr. Graham*).

Time of capture.—11, 12, 16, 18, 20. vi. 08.

Observations.—Caught in latrines at 8 A.M. Described from two perfect females and two males. A very distinct small species with marked thoracic spotting. Very numerous in June. Three females taken in same locality, 12 and 18. vi. 08, show only the two anterior silvery thoracic spots.

Genus PECTINOPALPUS, gen. nov.

Head clothed with narrow-curved scales except at the sides and around the eyes in front, and some upright forked scales ; antennæ plumose ; palpi of male as long as the proboscis, irregular in form, of three segments, basal one swollen at base, apical twice as long as the penultimate, both with rather long lateral hairs, the long segment with a series of outstanding scales of peculiar form in two groups of different shape. Thorax and scutellum with long narrow-curved scales.

A very distinct genus, told at once by the peculiar male palpi. I have been unable to find the female.

Pectinopalpus fuscus, sp. n.

Uniformly fuscous brown. Fragile. Palpi very irregular and twisted in form.

♂.—Head black, with pale smoky grey narrow-curved scales over most of the area, dusky grey flat lateral scales, and almost white ones around the eyes. Palpi and proboscis deep brown ; antennæ brown, with pale bands and flaxen plume-hairs ; the palpi have eight pale outstanding scales on long stalks on one side of the apical area of the long segment, and then eight dark long outstanding scales below of different form.

Thorax brown, with dull brown and dull pale golden rather long narrow-curved scales and deep brown chætæ ; scutellum paler brown, with narrow-curved pale scales and six brown bristles to the mid lobe ; metanotum pale brown.

Abdomen uniformly fuscous brown.

Legs uniformly brown ; femora and coxæ paler, the former

especially below ; fore and mid ungues unequal and uniserrate, hind equal and simple.

Wings with rather broad scales on the apex, with rounded tips ; first fork-cell longer and narrower than the second, its base about level with that of the latter, its stem more than half the length of the cell, stem of the second forked cell about the same length and about two-thirds the length of the cell ; posterior cross-vein longer than the mid, about twice its own length distant from it.

Length.—2.8 to 3 mm.

Habitat.—Obuasi (*Dr. Graham*).

Time of capture.—20. viii. 29 and 30. ix. 07.

Observations.—Caught in bush at 10 A.M. and 6 P.M.

A very obscure species, unless carefully examined, when the peculiar palpi at once separate it. I have been unable to distinguish the female in this collection.

Culex nigrocostalis, sp. n.

Very like a small *C. fatigans* or *C. pallidocephala*, but the thorax uniformly clothed with dull golden brown scales and the outer costal border of the wings very dark.

♀.—Head black, clothed with dull grey ragged narrow-curved scales, small dull grey flat lateral scales, and black upright forked scales ; clypeus deep brown, palpi and proboscis deep black ; antennæ deep brown, with narrow pale bands.

Thorax deep brown, clothed uniformly with small hair-like curved dull golden brown scales and deep brown chætæ, dull golden at their base ; scutellum paler brown, with scanty dusky hair-like curved scales, dull golden in some lights, and six deep brown border-bristles to the mid lobe.

Abdomen blackish brown, with narrow basal white bands and golden brown to golden border-bristles.

Legs deep blackish brown, unbanded ; femora pale below, a few pale scales at the apices of the femora and tibiæ ; ungues small, equal, and simple.

Wings with dark brown scales, the outer costal border and the first long vein and subcostal black ; first fork-cell longer and narrower than the second posterior, its base nearer the base of the wing, its stem less than one-third the length of the cell ; stem of the second fork-cell about two-thirds the length of the cell ; posterior cross-vein longer than the mid, sloping backwards, and about two and a half times its own length distant from it.

Length.—3 mm.

♂.—Like the female, but the abdomen more prominently banded. Palpi and proboscis deep brown, the former acuminate and longer than the proboscis by the last and apical portion of the penultimate segment, the last two segments with scanty long dark hairs. Ungues of fore and mid legs unequal, uniserrate, hind equal and simple. Wings with short fork-cells, the first slightly narrower and much longer than the second fork-cell, stem of the first about three-fourths the length of the cell, stem of the latter nearly as long as the cell; posterior cross-vein longer than the mid, nearly three times its own length distant from it.

Length.—4 mm.

Habitat.—Accra (*Dr. Graham*).

Hatched out.—7 and 18. vi. 08 (♂), 7. vii. 08 (♀).

Observations.—Described from a single perfect female, hatched from a long siphoned larva, and three males. This is a small rather obscure *Culex*, near *C. fatigans*, Wied., and *C. pallidocephala*, Theob., but can be told from both by the very dark outer costal border and veins near it. A small fragile species.

Culex pallidothoracis, sp. n.

Thorax uniformly clothed with pale ochreous scales. Abdomen dark brown in the female, with traces of pale basal banding, prominent in the male. Palpi, proboscis, and legs uniformly dark brown.

♀.—Head black, densely clothed with narrow-curved pale ochreous almost creamy scales, flat similar coloured lateral scales, rich golden brown central upright forked scales, and black upright ones at the sides; golden chætæ between the eyes, dark ones at the sides; clypeus brown; palpi and proboscis almost black; antennæ brown.

Thorax black, densely and uniformly clothed with narrow-curved pale ochreous almost creamy scales, with golden and brown chætæ; scutellum very pale, with similar scales and brown border-bristles; metanotum brown; pleuræ very pale.

Abdomen dark brown, some of the apical segments with basal creamy bands; border-bristles brown, golden at their apices; venter with many pale scattered scales; traces of basal lateral pale spots.

Legs uniformly brown, with dull ochreous reflections, paler beneath; unguis equal and simple.

Wings with the fork-cells long; the first longer and narrower than the second posterior, its base nearer the base of

the wing, its stem about one-third the length of the cell ; stem of the second about half the length of the cell ; posterior cross-vein nearly its own length distant from the mid ; scales of typical *Culex* form.

Length.—5 to 5.5 mm.

♂.—Similar to female, but the abdominal banding very pronounced. Palpi acuminate, black at the apices, paler basally, hairs dark ; antennæ with flaxen brown plume-hairs, paler at their apices. Fork-scales dense, dark behind as well as at the sides. Fore and mid unguis unequal, the larger with a large tooth, the smaller with a small one, hind equal and simple. Genitalia with a large broad foliate plate.

Length.—5 to 6 mm.

Habitat.—Obuasi (*Dr. Graham*).

Time of capture.—8. i. 08 ; 10. xii. 07 ; 20. vi. 07 ; 17. vii. 07 ; 7. viii. 07 ; 20. ix. 07 ; 18, 19. x. 07 ; 13. xi. 07.

Observations.—Caught on bush-paths. Described from a series of several males and females. It is very marked on account of the pronounced pale scaled thorax. The females show some variation in regard to abdominal banding, some showing it much more prominently than others.

LIV. — *The Application of Mr. G. W. Smith's Theory of Dwarf Males to Myzostoma*. By A. F. COVENTRY, Magdalen College, Oxford.

MR. G. W. SMITH has recently put forward a new theory to explain the complementary dwarf males found among the Cirripedia pedunculata.

He looks for the interpretation of the peculiar sexual relations among these, and, as he believes, also in the Rhizocephala, to the fundamental nature of secondary hermaphroditism—*i. e.*, imposed on a primitive dioecism, which we must suppose to have been the original condition among the Cirripedia.

Smith has found, both by observation and experiment, that this hermaphroditism can only be imposed on males.

Hence the ordinary monœcious Cirripedes are really males, all the females having been suppressed in the course of evolution ; and the complementary males are in an arrested state of development due to the condition of protandric hermaphroditism—*i. e.*, male generative products ripening before female—through which they at one time passed.

The same reasoning applies with very little modification to the Rhizocephala.

In these the dwarf males never become sexually mature, being represented by the *Cypris* larvæ found on the young *Sacculina externa*.

Smith believes that both these *Cypris* larvæ and the complementary males of the Pedunculata are potential hermaphrodites, in which development is arrested because of the position taken up by them on fully developed individuals of the same species.

This idea is supported by what occurs in the Epicarida, a group of parasitic Isopods. Here all individuals are at first larval males, which, after crawling upon the adult (functionally female) individuals and fertilizing them, migrate to and become parasitic upon their hosts—various Crustacea,—and there assume the female condition.

They are therefore protandric hermaphrodites.

Quite recently Orton has brought forward evidence of the same sort of thing in *Crepidula*, and he has expressly accepted Smith's theory as an explanation.

The facts known about *Myzostoma* seem to be susceptible of a similar interpretation, whether we accept Beard's or Wheeler's account of their life-history.

In the former case, the sexual relations of *Myzostoma* are exactly comparable with those of the Pedunculata; in the latter they are more like those of the Epicarida.

Beard described the dwarf dorsicolous males as never at any time showing traces of ovaries, while individuals found on the disc of the *Comatula* host have both ovaries and testes, even though they be smaller than the largest dorsicolous specimens. He therefore claimed that these are true complementary males.

Wheeler traversed this statement and said that the ovaries can always be found, even in the youngest dorsicolous individuals. He identified them with Nansen's "problematical organs."

Working on this assumption, he noted a gradual increase in size and activity in the ovary; and he was able to trace the animal through all stages, from the time when neither mature sperms, or only a very few, nor ova were present, to an almost purely female state, passing on the way through a stage when numerous mature sperms, but only immature ova, were present, followed by a completely hermaphrodite condition.

In spite of some criticisms from Beard, Wheeler's statements seem to be quite unshaken, and his evidence, both as regards descriptions and drawings, has all the appearance of being a more trustworthy guide to the real state of things.

We have, therefore, in the life-history of *Myzostoma*, as detailed by Wheeler, a remarkable confirmation of Smith's theory of secondary hermaphroditism, and a further case in which it appears to supply a complete interpretation of facts hitherto lacking an explanation.

LITERATURE.

1894. BEARD, J.—Zool. Anzeiger, xvii.
 1898. ———. Mittheil. Stat. Neapel, 1893-1899.
 1907. ORTON, J. H.—Proc. Royal Soc., B, vol. 81.
 1906. SMITH, G. W.—Naples Monogr. xxix.
 1894. WHEELER, W. M.—Zool. Anzeiger, xvii.
 1896. ———. Mittheil. Stat. Neapel, 1896-1897.

LV.—On the Affinities of *Astrosclera willeyana*, Lister. By R. KIRKPATRICK.

(Published by permission of the Trustees of the British Museum.)

[Plate XI.]

AMONG some sponges collected by Dr. C. W. Andrews, F.R.S., off Christmas Island, and presented to the Natural History Museum by Sir John Murray, were four small examples of *Astrosclera willeyana*, Lister. The specimens had been detached from a block of coral rock brought up from a depth of 46 fathoms, and had been put into alcohol. The largest example, which is mushroom-shaped, is 12 mm. high, 8 mm. in diameter at the base of the round stem, and 14 mm. in diameter across the convex head. The rounded upper surface is smooth and shows a reticulate pattern with irregularly meandrine or rounded meshes about a millimetre in diameter. Several stellate oscular areas are scattered over the surface. In a vertical section of the sponge the strands of the network are seen to be the edges of walls or lamellæ composed of loosely aggregated spherules, which amalgamate lower down to form solid masses.

A second columnar specimen, 12 mm. high, was decalcified and stained. A third example formed a small cylindrical nodule, and a fourth an irregular disk 7 mm. in diameter and 2-3 mm. thick.

Vertical longitudinal sections of the decalcified specimen showed a tubular network with numerous elongated longitudinal strands hanging down from a surface layer (of ectosome), and joined by fewer and shorter more or less transverse tubular bars.

The walls of the tubes were beset with siliceous spined acanthostyles set at a very acute angle and evidently pointing in the direction of exhalant currents. The spicules beneath the ectosome were vertically dressed.

The gaps in the tubular network, *i. e.* the meshes left after decalcification, were filled, in the complete state, with spherules of aragonite, separate in the upper part of the sponge, but fused into solid walls and masses in the lower.

All four specimens have the siliceous acanthostyles. One specimen has in addition centrotriænes, spined microxeas, and spirasters belonging to a species of *Triptolemus*, a Tetractinellid Theneid sponge, which seems to have a boring habit. The flagellated chambers are fairly well preserved. In some double-stained sections not thoroughly decalcified the aragonite spherules took the stain, the deeper stained central part of each spherule looking like a nucleus. Numerous embryos are present, especially below the ectosome.

In 1900 J. J. Lister published a memoir on *Astrosclera* in Willey's 'Zoological Results,' part iv. Four of the specimens he described came from 35 fathoms off Lifu; a fifth from 100 fathoms off Funafuti was sent to him from the British Museum.

He considered these organisms to be very aberrant calcareous sponges which appeared to show affinities with some of the Pharetronidæ. Recently I wrote to Mr. Lister asking for the loan of his preparations, all of which he very kindly sent to me.

In one of the longitudinal sections of a complete specimen showing hard and soft tissues I found on the outer edge of the section a number of vertically dressed acanthostyles, but the tissues of the canals were devoid of these spicules.

On decalcifying a fragment of the old and dead Funafuti specimen I found remains of much macerated acanthostyles, often reduced to a thin shell, but still recognizable as acanthostyles.

Mr. Lister had had imperfect material to work with, and could hardly have come to any other conclusion than the one he adopted.

My own views concerning this sponge are as follows:—*Astrosclera willeyana* is a siliceous Ectyonine sponge related to *Hymerhaphia*. Originally it was a small thin incrusting sponge with a skeleton constructed of separate vertical columns of acanthostyles with one spicule to each column. It acquired the habit common among its Ectyonine congeners of selecting special kinds of particles from its surroundings, which here include numerous aragonite-forming algæ corals,

&c.* *Aulena crassa* (Carter), with its main skeletal construction almost identical with that of *Astrosclera*, selects minute particles of siliceous or quartz sand. *Astrosclera* selects the more tractable spherules of an aragonitic sand. An artificial aragonitic sand made after Meigen's recipe (Bericht nat. Gesell. Freiburg, xiii. p. 9) resembles the supposed scleres of *Astrosclera*. Little masses of these spherules, each one of which is a radiating aggregate, make not a bad imitation of fragments of *Astrosclera* skeleton, for the artificial spherules vary in size and become polyhedral with mutual pressure.

The primarily separate spherules would gradually amalgamate to form walls, which would permit of the choanosome growing into folds; the lumen of the latter would gradually contract owing to the encroaching laminæ. The vertical acanthostyles in the tubular folds would tend to assume more and more an oblique position. The thin sponge crust became a disk, and the disk a column.

The character of forming a skeleton of aragonite has evidently been an eminently successful one for the little *Hymerhophia*-like sponge, for examples have been recorded from widely distant localities, viz. from 10 to 20 degrees south of the Equator and from longitudes 105° E., 166° E., and 175° W., from depths of 35–100 fathoms on coral rock. But apparently there have been penalties and drawbacks associated with this strange success, for the sponge has become subject to the attacks of boring organisms.

The tubular and honeycomb style of architecture is not uncommon among the Ectyonine relatives of *Astrosclera*. *Aulena* (*Holopsamma*) *crassa* (Carter), for instance, presents a very similar appearance to *Astrosclera* both on the surface and in section (see Lendenfeld, 'Mon. Horny Sponges,' pl. viii. figs. 1, 2); here the echinating styles are smooth.

I shall not attempt to give an account of the histology and cytology of *Astrosclera* at present, because the specimens, precious though they be, are not sufficiently well preserved. I shall be dredging off Christmas Island this autumn, and if I am fortunate enough to procure more specimens of this wonderful sponge I shall fix them at the moment of capture and in accordance with the best methods.

In the true siliceo-calcareous sponge *Merlia normani* ('Annals,' Feb. 1910, p. 288) the skeleton of calcite, which is formed by an epithelium on the external surface, partly supports the sponge, but chiefly shelters masses of archæo-

* For lists of calcitic and aragonitic organisms see Meigen, Centralb. für Mineralogie, 1901, p. 577, and Ber. nat. Gesellsch. Freiburg i. B. 1903, xiii. p. 51.

cytes. *Astrosclera* is, in my opinion, a purely siliceous sponge, and does not secrete aragonite.

Summary.—*Astrosclera willeyana*, Lister, is an Ectyonine sponge with a supplementary skeleton formed of foreign particles of aragonite, the latter being at first discrete, and later welded into concrete walls and blocks.

EXPLANATION OF PLATE XI.

Astrosclera willeyana, Lister.

Figs. 1-3. Specimens, nearly nat. size.

Fig. 4. Surface of specimen 3, $\times 10$.

Fig. 5. Longitudinal vertical section of soft tissues of a decalcified specimen, $\times 7$.

Fig. 6. The same, $\times 16$, showing acanthostyles in the walls of the choanosome and below the ectosome. This figure should have shown embryos.

Fig. 7. The same, $\times 65$.

Fig. 8. Acanthostyle from Christmas Island specimen, $\times 700$.

Fig. 9. Ditto from Lifu specimen, $\times 700$.

Fig. 10. Aragonite spherules, nearly but not wholly decalcified, with remains of radiating lines of particles deeply stained, the whole apparently imbedded in cell-like masses of protoplasm (? remnants of ground substance); no nuclei visible. $\times 1000$.

LVI.—*New Mammals from the E. Indian Archipelago.*

By OLDFIELD THOMAS.

(Published by permission of the Trustees of the British Museum.)

Pteropus liops, sp. n.

Very similar externally to *Pt. temminckii*, and agreeing with it in size, quality and distribution of fur, and general colour, but differing in the following details:—Face (including cheeks and chin) uniformly pale brown, without any tendency to the formation of eye-rings; in *temminckii* the face generally is whitish, the cheeks especially, while there are perceptible brown eye-rings carried forward anteriorly nearly to the nose, and contrasting with the narrow median buffy-whitish frontal line between them. Under surface, from sternum backwards, dark broccoli-brown, the hairs of this part being in *temminckii* broadly tipped with pale buffy.

Skull with the orbits markedly smaller than in *temminckii*.

Forearm of type 102 mm.

Hab. Buru Island.

Type. Subadult female. Original number 892. Collected August, 1909, by Mr. W. Stalker.

Dobsonia viridis umbrosa, subsp. n.

All essential characters as in *D. viridis* of the Kei Islands, but the colour averaging darker throughout. In the most marked specimens the crown is blackish "bistre" instead of "raw umber," the nape is a lighter shade of bistre instead of bright yellowish or "raw sienna," and the under surface near "mummy-brown" instead of "tawny olive" or "clay-colour."

Forearm of type 118 mm.

Hab. Ceram.

Type. Adult female. B.M. no. 7. 1. 1. 259. Collected in 1859 by A. R. Wallace. Purchased with the Tomes Collection.

Although in rare instances the Ceram *Dobsonia* has the bright coloration characteristic of the typical Kei *D. viridis*, the colour of the majority of specimens is so much darker that it should apparently have a definite subspecific name. Besides five specimens of *umbrosa* collected by Mr. Wallace, the Museum possesses a number of both Aru and Ceram forms obtained by the late Mr. W. Stalker.

Myotis (Leuconoe) stalkeri, sp. n.

A large species with enormous feet; no interfemoral fringe.

Size large, about equalling that in *M. pequinius*, therefore alone exceeded among Old-World members of *Leuconoe* by the Chinese *M. ricketti*. Fur very soft, fine, and velvety; hairs of back about 6 mm. in length. General colour a variable greyish brown with silvery gloss, the hairs blackish, with dark "broccoli-brown" tips; head rather greyer. Under surface strongly contrasted creamy whitish, the hairs slaty for two-thirds their length. Limbs and membranes uniform pale brown, naked throughout except just at the base of the tail; interfemoral without a fringe, though there are a few scattered hairs along its posterior border.

Ears of medium length; tragus long, narrow, pointed, with a well-marked external basal lobule. Feet exceedingly large, their proportionate size seeming to increase in this genus in the larger species.

Skull large, of normal shape. Middle upper premolar about half the size of the anterior, shut in in the internal angle between the other two. Middle lower premolar of the same proportionate size as above, but in the tooth-row. Other teeth as usual.

Dimensions of the type (the starred measurements taken in flesh) :—

Forearm 48 mm.

Head and body *62; tail *51; hind foot, s. u. *12, c. u. 15; ear *18. Tragus on inner edge 7·6; third finger, metacarpus 47, first phalanx 21; calcar (c.) 14.

Skull: greatest length 19·3; basi-sinual length 14·4; greatest breadth 12·2; breadth of brain-case 9·5; front of p^4 to back of m^3 5·3.

Hab. Ara, Kei Islands.

Type. Adult male. Original number 852. Collected July, 1909, by W. Stalker during the British Ornithological Union's Expedition to New Guinea.

This fine species is readily distinguishable by its large size, enormous feet, and fringeless interfemoral. Its nearest ally would seem to be *M. macrotarsus*, Waterh., from the Philippines, but that is decidedly smaller.

I have named it in honour of its discoverer Mr. W. Stalker, whose sad death by drowning shortly after the landing of the expedition in New Guinea deprives the Museum of one of its best and most enthusiastic collectors.

I may take this opportunity of stating that the specimens from Tasikmalaja, W. Java, recorded by Mr. Wroughton and myself as *M. hasselti*, Temm.†, really belong to *M. horsfieldi*, Temm., which is distinguishable from *M. adversus* by its wings being attached to the metatarsus instead of to the end of the tibia. I owe to the kindness of Dr. Jentink such particulars about the type as enable me to make this correction.

Paradoxurus kangeanus, sp. n.

A small dark-coloured species with small bullæ.

Size markedly less than in *P. javanicus*. General colour very dark, as dark as in *P. torvus* of the Tawi-Tawi Islands, and most nearly approaching "bistre." Markings very indistinct, owing to the general dark colour; in the middle of the back three short black stripes are perceptible, passing posteriorly into rows of spots. Ground-colour between the stripes dull clay-colour or cinnamon, where lightest, on the back, darker on the nape and shoulders. Under surface dark bistre-brown. Crown and backs of ears blackish or blackish brown, as are also the limbs and feet. Tail uniform dark brown.

Skull much smaller than that of *P. javanicus*, but its proportions similar. Bullæ small, but rather variable in size.

† P. Z. S. 1909, p. 381.

Teeth of medium size, broadly rounded, very much as in *P. javanicus*, but smaller.

Dimensions of the type (measured in the flesh):—

Head and body 500 mm.; tail 390; hind foot 72; ear 41.

Skull: condylo-basal length 96; greatest breadth 55; nasals in middle line 19; interorbital breadth 18; palatal length 43.5; p^4 , length along outer side 8.7; greatest oblique diameter 10.

Hab. Kangean Island, E.N.E. of Java.

Type. Adult male. Original number 2234. Collected 16th November, 1909, by G. C. Shortridge. Presented by Oldfield Thomas. Seven adults and five young examined.

This insular Paradoxure is readily distinguishable by its unusually dark colour.

Sciurus notatus maduræ, subsp. n.

Similar in all essential characters to true W.-Javan *notatus*, but paler throughout.

Back of the same general colour, but paler. Under surface from the chin backwards rich ochraceous buff, this colour mostly quite clear and bright, without greyish suffusion, at the bases of the hairs, except slightly on the belly. In true *notatus* the hairs of the throat, chest, and belly are broadly greyish basally, so that the buffy tips do not hide the grey bases, these, even when present on the belly, being completely hidden in *maduræ*. Buffy eye-rings much narrower and less conspicuous. Cheeks and sides of neck below and behind ears dull buffy. Ears themselves also more buffy. Light lateral line broader, dark one below it narrower and shorter than in *notatus*. Hands and feet similarly clear grizzled grey, contrasted with the general colour of the body and limbs; wrists and ankles more buffy than in *notatus*. Tail lighter in general colour, the buffy rings paler, those at the bases of the hairs white, the black rings rather narrower.

Skull and teeth as in *notatus*.

Dimensions of the type (measured in flesh):—

Head and body 195 mm.; tail 180; hind foot 44; ear 18.

Skull: greatest length 49.

Hab. Marengan, near Soemenep, E. Madura. Sea-level.

Type. Adult male. Original number 2157. Collected 2nd November, 1909, by G. C. Shortridge. Presented by Oldfield Thomas.

All the names currently considered as synonyms of *S. notatus* seem to have been given to specimens from Western Java. Whether the present paler form is confined to Madura or penetrates into Eastern Java remains to be seen.

Sciurus lowi bangueyæ, subsp. n.

Essential characters as in true N.-Bornean *lowi*, but the peculiar warmth subtracted from the general colour, so that instead of a warm brown the colour is dark greenish olivaceous, the light rings on the hairs buffy instead of ochraceous. Median dorsal area from crown to rump decidedly darker than the flanks. Sides of neck still lighter than flanks, a black postaural patch rather more conspicuous than in *lowi*. Tail-hairs ringed basally with buffy, their tips dull whitish, these colours being ochraceous and buffy respectively in true *lowi*.

Hind foot of type 33 mm.

Skull: gnathion to basilar suture 26.5; nasals 11; inter-orbital breadth 11.7; palatal length 19; upper tooth-series exclusive of p^3 7.

Hab. Banguey Island, N. of Borneo.

Type. Adult male. B.M. no. 94. 7. 2. 13. Collected January, 1894, by A. Everett.

Nannosciurus exilis retectus, subsp. n.

As in Bornean *exilis*, but general colour paler and the warm tawny or ochraceous tawny mantle practically absent, the nape and shoulders of the same dull grizzled buffy tone as the crown and rump; sides rather lighter; belly cream-buff instead of pinkish buff.

Skull rather smaller and lighter than in *exilis*.

Hind foot of type 19 mm.

Skull: front of interparietal to tip of nasals 21.3; zygomatic breadth 14.7; palatilar length 8.8; upper tooth-row exclusive of p^3 3.

Hab. Banguey Island, N.E. Borneo.

Type. Old male. B.M. no. 94. 7. 2. 14. Collected by A. Everett.

BIBLIOGRAPHICAL NOTICES.

PIERCE, W. DWIGHT. *A Monographic Revision of the Twisted Winged Insects comprising the Order Strepsiptera*, Kirby. (Smithsonian Institution. United States National Museum. Bulletin 66.) Washington, 1909, pp. xii, 232, pls. 15.

It was in the year 1813 that Kirby published a paper in the 'Transactions of the Linnean Society of London,' in which he

founded the new order Strepsiptera on two genera only, *Stylops melittæ*, parasitic on bees, and *Xenos rossii* (*Ichneumon vesparum*, Rossi) and *peckii*, parasitic on wasps. *Stylops melittæ* had, however, been previously described by Kirby in his 'Monographia Apum Angliæ,' and his graphic description of its discovery will be familiar to all entomologists.

A few other species were subsequently described by Kirby and others; but for many years the number was very small, and these curious insects were usually regarded as an aberrant family of Coleoptera. Prof. Pierce brings forward cogent reasons for considering these insects to form a separate order, and now estimates it as comprising no less than 8 families, 37 genera, and 120 species, many of which are described as new in the present work.

It now appears that Orthoptera, Hemiptera, and Homoptera are liable to the attacks of Strepsiptera, as well as the Hymenoptera, which have long been known to be infested by them; and the physiological changes induced in the hosts by these parasites are of much importance.

We commend this important monograph to entomologists interested in curious forms of insects, and in physiological inquiries.

W. F. K.

Indian Insect Life. A Manual of the Insects of the Plains (Tropical India). By H. MAXWELL-LEFROY, M.A., F.E.S., F.Z.S., Entomologist, Imperial Department of Agriculture for India; Author of 'Indian Insect Pests,' &c. Assisted by F. M. HOWLETT, B.A., F.E.S., Second Entomologist, Imperial Department of Agriculture for India. (Published under the Authority of the Government of India.) Agricultural Research Institute, Pusa. 4to. Calcutta and Simla, 1909. Pp. xii, 786. Pls. lxxxiv. and figs. 536.

UNQUESTIONABLY this is the handsomest and one of the most important works which have yet appeared on the insects of India. Hitherto the author has chiefly been known by his 'Indian Insect Pests' and 'Indian Museum Notes,' but his new book shows him to have a very comprehensive knowledge of all branches of entomology, especially as represented in the fauna of India. The Introduction deals with general subjects, and will appeal to many readers who have only a secondary interest in entomology. It contains discussions on Diagnosis, Zoological Position, Instinct and Habit, Classification, Number of Species, Nomenclature, Identification, Entomology in India, Zoogeographical Divisions, Food and Habitat, and Insects and Man.

In 1881 Blanford estimated the known species of insects found in British India at 12,100. At present Prof. Maxwell-Lefroy estimates the number of known species at 29,700. It is impossible even to estimate the actual number, for the fauna even of Britain is very far from exhausted; and the last part of the 'Transactions of

the Entomological Society of London' includes nine new genera and ten new species of Mymaridæ (Micro-Hymenoptera) captured within a few miles of London, and a new genus and species of Noctuidæ captured near Aberdeen. We may also note that within the last few weeks the discovery of a new species of Mymaridæ (said to be the smallest insect known) has been announced from India.

The orders of insects are discussed in the following series:—Aptera, Orthoptera, Neuroptera, Hymenoptera, Coleoptera, Lepidoptera, Thysanoptera, Diptera, and Rhynchota. There are also separate essays under each order on various subjects of general interest, such as Deceptive Colouring, Relative Duration of Life, Sex, Myrmecophilous Insects, Insects as Food, Silk, Blood-sucking Insects, Song in Insects, &c.; and the book concludes with a Plant Index and a General Index.

The better-known families of insects are treated with much detail, and are freely illustrated both with plain and coloured figures. The lesser-known families are more briefly dealt with, but the available sources of information are clearly indicated, and special attention is given to insect pests of all kinds.

We can hardly speak too highly of this most useful and comprehensive work. The only faults which we can find in it are its weight (which in comparison to its size is only approached by that of Comstock's 'Manual for the Study of Insects') and its size. These defects will make it difficult for a travelling entomologist to add it to his impedimenta; and we might perhaps be allowed to suggest to the painstaking author and his colleague that a small "pocket" manual of Indian entomology might be a great boon to entomologists travelling in India, without interfering with the usefulness or circulation of the larger work. W. F. K.

The Fauna of British India, including Ceylon and Burma. Published under the Authority of the Secretary of State for India in Council. Edited by A. E. SHIPLEY, M.A. &c. Dermaptera (Earwigs). By MALCOLM BURR, D.Sc. 8vo. Pp. xviii, 217. Pls. 10 (1 col.) and 16 text-figures.

IN the present half-volume of the 'Fauna Indica,' the first published under the editorship of Prof. Shipley, Dr. Burr has given an excellent Monograph of the Earwigs of British India; and as the group is a comparatively small one (135 species are described in the work before us, a number that could doubtless be easily quadrupled in a few years if collectors in India took up the group systematically), the author has been able to deal with it very fully, and to figure more than a hundred species, often with enlarged details of legs, forceps, &c.

Much useful information is also given about structure and habits, bibliography, geographical distribution, collecting and preserving,

&c. Dr. Burr alludes to the brittle character of dried specimens and the ease with which the forceps and last dorsal segment of the abdomen are liable to become detached, when they are frequently stuck on upside down. He mentions that Serville founded a new genus on such a specimen; but earwigs are not the only insects which are liable to similar accidents, and it is less generally known that Walker's genus *Larnaca*, which was described as differing from *Gryllacris* chiefly in the position of the ovipositor, was founded on a specimen of *Gryllacris* which had been broken, and the abdomen had been reversed in the process, so that the ovipositor curved downwards instead of upwards.

Our knowledge of the insects of our home and foreign possessions is now rapidly increasing, and the best means of advancing it is by the publication of books like the present, which, however, often give such an impetus to the study of the particular group with which they deal as to render themselves nearly obsolete in a comparatively short time.

PROCEEDINGS OF LEARNED SOCIETIES.

GEOLOGICAL SOCIETY.

December 1st, 1909.—Prof. W. J. Sollas, LL.D., Sc.D., F.R.S.,
President, in the Chair.

The following communication was read:—

‘On some Small Trilobites from the Cambrian Rocks of
Comley (Shropshire).’ By Edgar Sterling Cobbold, F.G.S.

The majority of the trilobites noticed in this communication were obtained during the progress of some of the excavations referred to in the Report of the Geological Excavations Committee of the British Association, read at the Dublin Meeting, 1908.

The specimens were derived from the *Olenellus* Limestone of Comley, and from the Grey Limestones which intervene between that horizon and the Conglomeratic Grit yielding a *Paradoxides*-fauna.

The Author notices the occurrence of *Microdiscus lobatus*, Hall, *M. speciosus*, Ford, *M. helena*, Walcott, and *Ptychoparia* (?) *atleboroughensis*, S. & F. He describes eleven species, apparently new, which he refers to the genera *Microdiscus*, *Ptychoparia*, *Micmacca* (?), *Agraulos* (*Strenuella*), *Anomocare* (three species), *Protolenus* (two

species), and two species to a new genus, to which Mr. Matthew's species *Mimacca* (?) *plana* may also be referred.

All the trilobites are represented by detached portions or fragments, often mixed indiscriminately, two or three species together, in the separate bands of rock; and the Author adduces in some detail the evidence for correlating certain free-cheeks, thoracic segments, and pygidia with the various head-shields, so that future workers may clearly distinguish between that which is actual fact and that which is a matter of inference.

January 12th, 1910.—Prof. W. J. Sollas, LL.D., Sc.D., F.R.S.,
President, in the Chair.

The following communication was read:—

‘On the Igneous and Associated Sedimentary Rocks of the Glensaul District (County Galway).’ By Charles Irving Gardiner, M.A., F.G.S., and Prof. Sidney Hugh Reynolds, M.A., F.G.S.; with a Palæontological Appendix by Frederick Richard Cowper Reed, M.A., F.G.S.

The general succession of the rocks of the Glensaul district is as follows, in descending order:—

3. ? Bala Beds. Conglomerates and Sandstones.

These beds have not been studied.

2. Shangort and Tourmakeady Beds.

Thickness
in feet.

- | | |
|--|--------------------------------------|
| (8) Calcareous gritty tuff of no great coarseness, sometimes becoming so calcareous as to pass into fairly pure limestone, enclosing also bands and patches of limestone-breccia, and, more rarely, bands of highly fossiliferous limestone which in some cases has been shattered by earth-movements. | |
| (7) Very coarse tuff or breccia, mainly composed of felsite-fragments: associated with it are inpersistent bands of fine tuff | 750 |
| (6) Tuff, coarse and fine, with occasional patches of calcareous beds, and at one point graptolitic beds indicating the zone of <i>Didymograptus hirundo</i> | 150 |
| (5) Great felsite sill of Tonaglanna and Greenaun | 1100 |
| (4) Coarse grit | 20 |
| (3) Gritty tuff | varying in thickness from 520 to 620 |
| (2) Coarse tuff or breccia, mainly composed of felsite-fragments | 75 |
| (1) Fine banded tuff..... | 55 |

1. Mount Partry Beds.

- | | |
|--|---------|
| (4) Coarse grits | 150 |
| (3) Fine grits and tuffs associated with black chert, graptolitic beds, and a prominent band of coarse tuff or breccia about 30 feet thick. The graptolites indicate the zone of <i>Didymograptus extensus</i> | (?) 150 |
| (2) Coarse grits | 110 |
| (1) Coarse conglomerates, about 600 feet seen. | |

The graptolitic beds occurring in Band 3 of the Mount Partry Beds have yielded nineteen species, which have been determined by Miss G. L. Elles, D.Sc., who considers that they indicate the upper part of the zone of *Didymograptus extensus*. The commonest species met with are *D. extensus*, Hall, and *D. bifidus*, Hall, both species being represented by small mutations. Rounded bodies, which a comparison with the better preserved specimens from the Tourmakeady district shows to be almost certainly radiolaria, were noted in sections of the cherts and shaly beds at several points.

In a previous description of the rocks of the Tourmakeady district, the term Shangort Beds was applied to a series of grits and tuffs, and the term Tourmakeady Beds to an associated series of calcareous strata which generally take the form of limestone-breccias. In the Glensaul district it is not possible to draw a sharp line of distinction between the two rock-types, some of the calcareous gritty tuffs passing into nearly pure limestone; but the Authors retain the terms to indicate the close connexion between the two districts.

The fossils from the Shangort and Tourmakeady Beds, which have been examined by Mr. F. R. Cowper Reed, show a close resemblance to those of the Tourmakeady district; but the finding of certain additional forms, especially *Nileus armadillo* and *Niobe* sp., has impressed upon Mr. Reed the close connexion between this fauna and that of the *Orthoceras* Limestone of Sweden, and has convinced him that it is rather of Arenig than of Llandeilo age. The conclusion is in conformity with the field-evidence, for at one point beds of gritty shale, containing radiolaria and graptolites (indicating the zone of *Didymograptus hirundo*), occur associated with the tuff of the Shangort Beds. The relegation of the Shangort and Tourmakeady Beds of Glensaul to the Arenig would imply a similar age for those of the Tourmakeady district.

The Glensaul district contrasts strongly with that of Tourmakeady as regards the character of the crystalline igneous rocks, which are all quartz-felsites, and the Authors believe them to be entirely intrusive.

Mr. F. R. C. Reed describes one species of *Illænus*, one of *Niobe*, one of *Nileus*, two of *Bathyrurus*, three of *Cheirurus*, one of *Pliomera*, one of *Encrinurus*, one of *Phacops*, and a new species of *Bathyrurellus*. He also describes three species of *Orthis*, one of *Hyolithes*, one of *Rafinesquina*, one of *Camerella*, and one of *Porambonites*, and his conclusions as to the evidence which is furnished by the fauna regarding the age of the beds are mentioned above.

WORKS PUBLISHED BY TAYLOR AND FRANCIS.

- The London, Edinburgh, and Dublin Philosophical Magazine. Monthly. 2s. 6d.
- The Annals and Magazine of Natural History. Monthly. 2s. 6d.
- The Observatory, Monthly Review of Astronomy. 1s.
- Aëronautics, by Brewer and Alexander. 6s.
- Anderson's Fauna of Mergui Archipelago. Vol. I. 30s., Vol. II. 15s.
- Baird's Manual for Tidal Observations. 7s. 6d.
- Blakesley's Table of Hyperbolic Sines and Cosines. 1s.
- Cooke's Flora of the Presidency of Bombay. Vol. I., Part I. 8s., Part II. 9s., Part III. 10s. Vol. II., Part I. 9s., Part II. 9s., Parts III. & IV. 8s. each.
- Cunningham's Binary Canon. 15s.
- Denning's Great Meteoric Shower of November. 1s.
- Denning's Telescopic Work for Starlight Evenings. 10s.
- Douse's Introduction to Gothic of Ulfilas. 7s. 6d. net.—Examination of an Old Manuscript, sometimes called The Northumberland Manuscript. 2s. 6d. net.
- Examination Papers set by Examining Board of Physicians and Surgeons. 6d.
- Ditto for Diploma in Public Health. 6d.
- Faraday's Experimental Researches in Chemistry and Physics. 15s.
- Fauna of British India : Mammalia. 20s. — Fishes. 2 vols. 20s. each.—Birds. Vol. I. 20s. Vols. II., III., and IV. 15s. each.—Reptilia and Batrachia. 20s.—Moths. 4 vols. 20s. each.—Hymenoptera. Vol. I. WASPS AND BEES. 20s. Vol. II. ANTS AND CUCKOO-WASPS. 20s.—Arachnida. 10s.—Rhynchota. Vols. I.-III. 20s. each. Vol. IV., pts. 1 and 2. 10s. each.—Butterflies. Vols. I. and II. 20s. each.—Coleoptera. Vol. I. 10s.—Coleoptera. CHRYSOMELIDÆ, Vol. I. 20s.—Mollusca. 10s.
- Glaisher's Barometer Tables, 1s. Diurnal Range Tables, 1s. 6d.
- Glaisher's Hygrometrical Tables. 2s. 6d.
- Glaisher's Factor Tables for Fourth, Fifth, and Sixth Millions. 20s. each.
- Godwin-Austen's Land and Freshwater Mollusca of India. Vol. II., Part X. 21s.
- Joule's Scientific Papers. Vol. I. 20s. Vol. II. 12s.
- Kelvin's (Lord) Tables for facilitating Sumner's Method at Sea. 10s. 6d. Forms for ditto. SUN, 1s. STARS, 1s.
- Kirby's Supplement to Diurnal Lepidoptera. 1871-1877. 8s. 6d. net. Lepidoptera Heterocera.—SPHINGES & BOMBYCES. 1892. £2 2s. net. Neuroptera Odonata. 1890. 16s. net.
- Lehfeldt, R. A. A List of chief Memoirs on Physics of Matter. 2s. 6d.
- Lewis's Systematic Catalogue of Histeridæ. 5s. net.—Catalogue of Japanese Coleoptera. 2s. 6d.; on one side, 3s. 6d.
- London Hospital Pathological Catalogue. 7s. 6d. net.
- McIntosh's Marine Invertebrates and Fishes of St. Andrews. 21s.
- Physical Abstracts. Vols. I. to III. 17s. 6d. each.
- Physical Memoirs, translated from foreign sources. Vol. I. Part I. 4s., Part II. 7s. 6d., Part III. 6s.
- Reade's Origin of Mountain-Ranges. 21s.
- Royal College of Surgeons : Calendar. 1s. net.
- Catalogue of Specimens illustrating the Osteology of Vertebrate Animals in Museum. Part 3. AVES. 12s. net.
- Catalogue of Teratological Series. 5s. net.
- Dermatological Collection. 3rd ed. 4s. net.
- Physiological Series. Vols. I. and II. 2nd ed. 12s. net each.
- Appendices 5, 6, 7, 8, and 9 to the Second Edition of Descriptive Catalogue of the Pathological Specimens in Museum. 2s. each.
- Examination Papers for Diploma of Fellow and Licence in Dental Surgery. 6d.
- Univ. Coll. London Calendar, 2s. 6d. Pathological Catalogue, Parts 1 to 3, 2s. each; Part 4, 1s. Library Catalogue, 3 Vols. 7s. 6d.
- Univ. Coll. Medical and Biological Catalogue. 2s. 6d.
- Wheatstone's Scientific Papers. 15s.

	Page
XLIII. Rhynchotal Notes.—L. By W. L. DISTANT	297
XLIV. The Collections of William John Burchell, D.C.L., in the Hope Department, Oxford University Museum:—	
IV. On the Lepidoptera Rhopalocera collected by W. J. Burchell in Brazil, 1825-1830. By E. G. JOSEPH, of Lincoln College, Oxford	322
XLV. On Hexactinellid Spicules and their Names.—Part II. Supplementary. By R. KIRKPATRICK	347
XLVI. A new Chinese Mole of the Genus <i>Scaptochirus</i> . By OLDFIELD THOMAS	350
XLVII. Three new West African Mammals. By OLDFIELD THOMAS.	351
XLVIII. The Caudal Fin of the <i>Elopidae</i> and of some other Teleostean Fishes. By C. TATE REGAN, M.A.	354
XLIX. An interesting Structural Analogy. By AUSTIN HOBART CLARK	358
L. Descriptions and Records of Bees.—XXVII. By T. D. A. COCKERELL, University of Colorado	361
LI. Two new African Shrews. By WILFRED H. OSGOOD	369
LII. List with Notes on some Land-Shells from the Island of Muswar, Dutch New Guinea, and Descriptions of new Species and Varieties of <i>Planispira</i> (<i>Cristigibba</i>), <i>Papuina</i> , <i>Culgeia</i> , and <i>Leptopoma</i> . By HUGH C. FULTON	370
LIII. Five new <i>Culicidae</i> from Ashanti. By F. V. THEOBALD, M.A. &c.	373
LIV. The Application of Mr. G. W. Smith's Theory of Dwarf Males to <i>Myzostomat</i> . By A. F. COVENTRY, Magdalen College, Oxford.	378
LV. On the Affinities of <i>Astrosclera willeyana</i> , Lister. By R. KIRKPATRICK. (Plate XI.)	380
LVI. New Mammals from the E. Indian Archipelago. By OLDFIELD THOMAS	383

BIBLIOGRAPHICAL NOTICES.

PIERCE, W. DWIGHT. A Monographic Revision of the Twisted Winged Insects comprising the Order <i>Strepsiptera</i> , Kirby	387
Indian Insect Life. A Manual of the Insects of the Plains (Tropical India). By H. MAXWELL-LEFROY, M.A., F.E.S., F.Z.S., Entomologist, Imperial Department of Agriculture for India. Assisted by F. M. HOWLETT, B.A., F.E.S., Second Entomologist, Imperial Department of Agriculture for India	388
The Fauna of British India, including Ceylon and Burma. Edited by A. E. SHIPLEY, M.A. &c. Dermaptera (Earwigs). By MALCOLM BURR, D.Sc.	389

PROCEEDINGS OF LEARNED SOCIETIES.

Geological Society	390, 391
--------------------------	----------

* * * It is requested that all Communications for this Work may be addressed, post-paid, to the Care of Messrs. Taylor and Francis, Printing Office, Red Lion Court, Fleet Street, London.

THE ANNALS
AND
MAGAZINE OF NATURAL HISTORY,
INCLUDING
ZOOLOGY, BOTANY, AND GEOLOGY.



CONDUCTED BY

ALBERT C. L. G. GÜNTHER, M.A., M.D., PH.D., F.R.S.,
WILLIAM CARRUTHERS, PH.D., F.R.S., F.L.S., F.G.S.,
AND
WILLIAM FRANCIS, F.L.S.

BEING A CONTINUATION OF THE "ANNALS" COMBINED WITH
MESSRS. LOUDON AND CHARLESWORTH'S "MAGAZINE OF NATURAL HISTORY."

LONDON:

TAYLOR AND FRANCIS, RED LION COURT, FLEET STREET.

Sold by Simpkin, Marshall, Hamilton, Kent, & Co., Ltd.: Baillière, Paris:
Hodges, Figgis, & Co., Dublin: and Asher, Berlin.

THE FAUNA OF BRITISH INDIA, INCLUDING CEYLON AND BURMA.

Published under the authority of the Secretary of State for India in Council.

Edited by A. E. SHIPLEY, M.A., F.R.S.

Med. 8vo, with text illustrations and 10 plates. Price 10s.

DERMAPTERA (EARWIGS). By Dr. MALCOLM BURR, M.A., F.L.S.

TAYLOR and FRANCIS, Red Lion Court, Fleet Street, E.C.

BIOLOGIA CENTRALI-AMERICANA.

Edited by F. DUCANE GODMAN.

SUBJECTS IN PROGRESS.

ZOOLOGY.

Coleoptera. Vol. IV. part 3 (RHYNCHOPHORA: Curculionidæ). By D. SHARP. (Pp. 1-168, pls. i.-vi.)

Coleoptera. Vol. IV. part 7 (RHYNCHOPHORA: Curculionidæ, *continued*). By G. C. CHAMPION. (Pp. 1-150, pls. i.-vi.)

Lepidoptera Heterocera. Vol. IV. By LORD WALSLINGHAM. (Pp. 1-40, pl. i.)

The Price of each Part is 21s.

London: Published for the Editor by DULAU & Co., Soho Sq., W.

LAND AND FRESHWATER MOLLUSCA OF INDIA.

Part XI., Vol. II. Price 21s.

By Lieut.-Col. H. H. GODWIN-AUSTEN, F.R.S., &c.

With 15 Plates and 70 pages Text, with descriptions of many new
Species belonging to the Genera:

Macrochlamys, Euaustenia, Cryptaustenia, Eurychlamys,
Austenia, Durgella, Leptodontarion, Sakiella, Pseudo-
kaliella, Sarika, Euplecta, and Papisoma.

TAYLOR and FRANCIS, Red Lion Court, Fleet Street, E.C.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[EIGHTH SERIES.]

No. 29. MAY 1910.

LVII.—*Descriptions of some new Species of Heterocera from Tropical Africa.* By HERBERT DRUCE, F.L.S. &c.

Fam. Syntomidæ.

Pseudapiconoma batesi, sp. n.

Female.—Head, collar, and tegulæ chrome-yellow; antennæ black, the base bright red; palpi red; thorax brown; abdomen chrome-yellow, banded with black, the anal segment bright red; legs red. Primaries dark brown, the costal vein bright red from the base almost to the apex; two small chrome-yellow spots edged with red beyond the cell nearest the costal margin; a square chrome-yellow spot at the end of the cell, a small spot below, and a rather large oval-shaped spot nearest the inner margin, all the spots edged with red, the veins red: secondaries uniform chrome-yellow. Under-side very similar to the upperside, the base of the primaries yellow; a round yellow dot nearest the apex; secondaries as above.

Expanse 2 inches.

Hab. W. Africa, Bitje, Ja River, Cameroons, 2000 feet, dry season (*G. L. Bates, Mus. Druce*).

Pseudapiconoma laureola, sp. n.

Male.—Head, tegulæ, thorax, and abdomen pale fawn-colour; collar red, tegulæ edged with red, abdomen banded

Ann. & Mag. N. Hist. Ser. 8. Vol. v.

27

with red on each segment; antennæ black; underside of thorax and upperside of the legs red. Primaries pale fawn-colour, the veins darker in colour; a square-shaped hyaline spot edged with red in the cell, below which is a small round hyaline spot edged with red; beyond the cell a band of five hyaline spots partly cross the wing, the first two spots the smallest, the third and fourth spots considerably larger, the fifth spot small; the fringe fawn-colour: secondaries cream-colour, broadly pink along the inner margin, the fringe fawn-colour at the apex. Underside very similar to the upperside, but paler in colour.—*Female* very similar to the male, but larger, the secondaries much redder.

Expanse, ♂ $1\frac{3}{4}$, ♀ $2\frac{1}{2}$ inches.

Hab. West Africa, Bitje, Ja River, Cameroons, 2000 feet, wet season (*G. L. Bates, Mus. Druce*).

Allied to *Pseudapiconoma specuîrgera*, Grunb.

Pseudapiconoma umbra, sp. n.

Male.—Head, collar, tegulæ, and thorax dark brown; palpi and antennæ black; abdomen greyish brown, each segment banded with chrome-yellow; the underside and the legs dark brown. Primaries dark brown; a small hyaline dot in the cell, one below, and five hyaline spots crossing the wing beyond the cell; the fringe dark brown: secondaries dark brown, pinkish at the base and along the inner margin; three small hyaline spots below the end of the cell, the first minute, the second the largest; the fringe dark brown. The underside the same as the upperside, except that the inner margin of the primaries is pink from the base to the anal angle.

Expanse $2\frac{1}{2}$ inches.

Hab. West Africa, Bitje, Ja River, Cameroons, 2000 feet, wet season (*G. L. Bates, Mus. Druce*).

This species differs from all others known to me by having hyaline spots on the secondaries.

Metarctia noctis, sp. n.

Male.—Head, antennæ, collar, tegulæ, underside of the abdomen, and legs reddish brown; thorax and abdomen black. Primaries black, the costal margin edged with yellowish brown; the fringe black: secondaries semihyaline black, darkest at the apex and along the inner margin. On the underside the wings are yellowish at the base.

Expanse $1\frac{1}{4}$ inch.

Hab. Abyssinia, Dire Daoua (*G. Kristensen, Mus. Druce*).

Metarctia ferrigera, sp. n.

Female.—Head, collar, tegulæ, thorax, and abdomen greyish brown, antennæ and palpi black, legs reddish brown. Primaries greyish brown, thickly irrorated with darker brown scales; a dark brown spot at the end of the cell, one beyond and one below the cell; a marginal row of dark brown spots extends from the apex to the anal angle: secondaries pale yellow.

Expanse $2\frac{1}{2}$ inches.

Hab. W. Africa, Bitje, Ja River, 2000 feet, dry season (*G. L. Bates, Mus. Druce*).

Fam. *Agaristidæ*.*Xynthospilopteryx batesi*, sp. n.

Female.—Head, palpi, antennæ, collar, tegulæ, thorax, legs, and the abdomen black; head, palpi, collar, and tegulæ spotted with white. Primaries black, crossed near the apex by a wide chrome-yellow band that does not extend to the outer margin; a large chrome-yellow spot at the end of the cell, a larger one below the cell, and a small round spot at the anal angle; several blue spots on the costal margin and two blue streaks between the chrome-yellow bands; two chrome-yellow streaks on the inner margin, the marginal one the largest; the fringe white at the apex, the fringe along the outer margin black: secondaries deep black, the fringe white. Underside: primaries as above; secondaries black, with a wide yellow band along the costal margin extending from near the base almost to the apex; the fringe of both wings white.

Expanse $3\frac{1}{2}$ inches.

Hab. West Africa, Bitje, Ja River, Cameroons, 2000 feet, wet season (*G. L. Bates, Mus. Druce*).

This species is allied to *Xynthospilopteryx grandis*, Druce, from Old Calabar.

Xynthospilopteryx comaria, sp. n.

Male.—Head, palpi, collar, and tegulæ black, spotted with white; antennæ black; thorax black, with two central white spots, the base of the thorax clothed with chrome-yellow hairs; abdomen brownish black, the upperside and sides spotted with white, the underside black, banded with white; legs black, banded with yellow and white. Primaries black, a white band near the apex crossed by black veins; a square

white spot at the end of the cell ; an oval-shaped white spot below, a large white spot close to the base, and a minute white dot at the base ; the fringe black : secondaries carmine-red, shading to chrome-yellow near the apex ; the apex and outer margin broadly bordered with black ; the fringe black. Underside : primaries chrome-yellow, the costal margin, a round spot in the cell, a wide bar at the end of the cell, the apex, and outer margin all black : secondaries very similar to the upperside, but the black mark at the end of the cell is much more distinct ; the fringes of both wings black.

Expanse 3 inches.

Hab. West Africa, Bitje, Ja River, Cameroons, 2000 feet, dry season (*G. L. Bates, Mus. Druce*).

Fam. Lasiocampidæ.

Lasiocampa noctis, sp. n.

Male.—Head, antennæ, palpi, collar, and thorax black ; abdomen black, the underside reddish brown ; legs brown. Primaries and secondaries brownish black ; a blackish-grey ill-defined mark beyond the cell ; the fringes of both wings black. Underside : primaries fawn-colour, the costal margin, apex, and outer margin brownish black : secondaries fawn-colour, thickly irrorated with brown scales ; a waved central brown line crossing the middle of the wing from the costal to the inner margin ; several indistinct brown spots near the anal angle.

Expanse 2 inches.

Hab. W. Africa, Upper Kasai District, Congo Free State (*P. Landbeck, Mus. Druce*).

Allied to *Lasiocampa heres*, Schaus, from Sierra Leone.

Lomadonta albisigna, sp. n.

Male.—Head, collar, and tegulæ yellowish white ; antennæ pale brown ; thorax and upperside of the abdomen pale yellowish brown ; the underside of the thorax, abdomen, and legs white. Primaries pale yellow, crossed with fine waved reddish lines ; a square white spot below the end of the cell and a wide greyish-brown band crosses the wings near the apex from the costal to the outer margin ; the fringe alternately yellow and greyish brown : secondaries pure white, clouded with pale yellowish brown at the apex and partly round the outer margin. Underside : both wings pure white ; primaries with the greyish-brown band as above, the apex shaded with yellow.

Expanse $1\frac{1}{2}$ inch.

Hab. West Africa, Bitje, Ja River, Cameroons, 2000 feet, dry season (*G. L. Bates, Mus. Druce*).

Allied to *Lomadonta johnstoni*, Auriv., but very distinct.

Trabala charon, sp. n.

Male.—Head, collar, tegulæ, thorax, and abdomen pale yellowish green; antennæ pale brown. Primaries pale green, a small black dot at the end of the cell, a faint curved pale brown line close to the base, a curved zigzag fine brown line beyond the cell extending from the costal to the inner margin, where it joins a cluster of brownish scales; a submarginal row of small brown spots extending from the apex to the inner margin near the anal angle: secondaries pale green, with the pale brown lines continued as on the primaries to the inner margin. Underside very similar to the upperside. —*Female* similar to the male; the brown lines are more distinct on both wings, but the submarginal spots are fainter.

Expanse, ♂ $1\frac{1}{2}$, ♀ 3 inches.

Hab. West Africa, Bitje, Ja River, Cameroons, 2000 feet, dry season (*G. L. Bates, Mus. Druce*).

Allied to *Trabala sulphurea*, Koll.

Fam. Notodontidæ.

Macronadata viridis, sp. n.

Male.—Head, collar, tegulæ, and thorax pale olive-green; antennæ pale brown, deeply pectinated, the shaft spotted with white; palpi brown, clothed with greenish-white hairs; legs brown and white; abdomen brownish white. Primaries pale olive-green, the costal margin white, the lower half of the outer margin and the apex broadly yellow; two faint brown waved lines cross the wing about the middle from the costal to the inner margin; an indistinct submarginal brown line extends from the apex to the anal angle; the fringe brown and white: secondaries pale yellow, the costal margin and apex pale greyish brown, the fringe white. Underside of primaries blackish grey, yellowish at the anal angle and along the inner margin; secondaries greyish white, a black spot at the end of cell and a very faint brown submarginal line from the apex to the inner margin; the costal half of the wing is irrorated with brown scales.

Expanse 3 inches.

Hab. W. Africa, Bitje, Ja River, Cameroons, 2000 feet, wet season (*G. L. Bates, Mus. Druce*):

Allied to *M. collaris*, Moeschl., and *M. brunneidorsa*, Holl., but very distinct.

Fam. Geometridæ.

Pitthea flavimargo, sp. n.

Male.—Head, antennæ, palpi, tegulæ, and thorax black; front of the head and collar white; abdomen above bright glossy blue; underside of the thorax and abdomen chrome-yellow; legs black. Primaries black, partly crossed near the apex by a narrow semihyaline white streak; the base of the wing broadly semihyaline white, shot with metallic blue at the base: secondaries bright metallic blue, broadly bordered with black; a wide semihyaline white band extends from the middle of the costal margin to the end of the cell, where it comes to a point. Underside: primaries very similar to the upperside, but shaded with brown along the costal margin and at the apex: secondaries chrome-yellow, the semihyaline white band the same as above, but edged with black; the outer margin from the apex to the anal angle edged with black.

Expanse $1\frac{3}{4}$ inch.

Hab. W. Africa, Bitje, Ja River, Cameroons, 2000 feet, dry season (*G. L. Bates, Mus. Druce*).

Pitthea eximia, sp. n.

Male.—Head, antennæ, palpi, tegulæ, and thorax black; collar dark orange; front of head white; abdomen bright metallic blue; underside of the thorax and abdomen dark orange; legs bluish black. Primaries black, glossed with bright blue, the base and a small band near the apex white: secondaries white, broadly bordered with black at the apex and anal angle, the white and black glossed with blue. Underside similar to the upperside, the costal margin and the apex of the primaries and the apex of the secondaries shaded with yellowish brown; the fringes of both wings black.

Expanse $1\frac{3}{4}$ inch.

Hab. W. Africa, Bitje, Ja River, Cameroons, 2000 feet, dry season (*G. L. Bates, Mus. Druce*).

Pitthea fuliginosa, sp. n.

Male.—Head, antennæ, collar, tegulæ, and thorax black;

abdomen black above, yellowish brown on the underside ; legs black. Primaries black, crossed by two semihyaline dusky bands, the first near the apex, the second close to the base ; the fringe black : secondaries black, with a central dusky hyaline band crossing the wing from the costal to the outer margin, where it ends in a yellow spot, the apex edged with yellow. Underside very similar to the upperside, but the inner half of the secondaries streaked with yellow.—*Female* very similar to the male, but rather larger and without any yellow on the upperside of the secondaries.

Expanse, ♂ $1\frac{3}{4}$, ♀ 2 inches.

Hab. W. Africa, Udamba, Kuila River, S.W. Congo State (*J. S. Bouxfeld*) ; Upper Kasai District, Congo Free State (*P. Landbeck, Mus. Druce*).

Allied to *Pitthea trifasciata*, Dewitz, but very distinct.

Pitthea albolineata, sp. n.

Male.—Head, palpi, antennæ, tegulæ, thorax, and abdomen black, front of the head white, collar yellow ; underside of the abdomen yellow ; legs black. Primaries black, crossed near the base from the costal to the inner margin by a narrow creamy white band ; a creamy white band near the apex, that does not extend to either margin : secondaries black, a narrow creamy white central band extends from the middle of the costal margin almost to the outer margin. Underside : primaries very similar to the upperside, but streaked with yellow at the base ; secondaries as above, streaked with yellow at the base and along the inner margin, the white central line broadly bordered with yellow.

Expanse $1\frac{3}{4}$ inch.

Hab. West Africa, Bitje, Ja River, Cameroons, 2000 feet, dry season (*G. L. Bates, Mus. Druce*).

Aletis sapor, sp. n.

Male.—Head, antennæ, and thorax black ; collar white ; tegulæ black, edged with white ; abdomen black above, spotted with white on each side ; the underside red ; legs black. Primaries brick-red, the apex broadly black ; four small white spots cross the wing close to the apex ; the fringe black : secondaries brick-red, edged with black from the apex to the anal angle, a marginal row of small white dots extends from the apex to the anal angle. Underside the same as above, but lighter in colour.—*Female* the same as the male,

with all the white spots considerably larger, also redder on the underside.

Expanse, ♂ 2, ♀ $2\frac{1}{4}$ inches.

Hab. West Africa, Bitje, Ja River, Cameroons, 2000 feet, dry season (*G. L. Bates, Mus. Druce*).

Aletis landbecki, sp. n.

Male.—Head and antennæ black, front of head and collar white; tegulæ and thorax orange-yellow; abdomen grey, striped with black, the underside and the legs greyish white. Primaries, the basal two-thirds of the wing dark orange-yellow, the apical third black; a large oval-shaped white spot near the apex crossed by the black veins; the fringe black: secondaries dark orange-yellow; a minute black dot at the end of the cell; the apex and outer margin bordered with black; three white spots on the black border close to the anal angle. Underside very similar to the upperside, but paler in colour.

Expanse $1\frac{1}{2}$ inch.

Hab. West Africa, Upper Kasai District, Congo Free State (*P. Landbeck, Mus. Druce*).

Anmenopsyche agis, sp. n.

Male.—Head, antennæ, and thorax black; collar and tegulæ white; abdomen above black, spotted with white; the underside and legs yellowish white. Primaries white, the base and half the costal margin very pale yellow, the costal margin from the middle to the apex and outer margin black: secondaries white, the base and inner margin broadly pale yellow, thickly irrorated with black scales from below the cell to the anal angle; the outer margin from the apex to the anal angle bordered with black, deeply dentated on the inner side. Underside the same as above.

Expanse 2 inches.

Hab. Uganda (*Simon, Mus. Druce*).

Anmenopsyche thestis, sp. n.

Male.—Head and antennæ black; collar white; tegulæ black, edged with white; thorax black, with three large white spots close to the base; abdomen above grey, the segments edged with yellow, and a central row of white spots extends from the base to the anus; underside of the abdomen yellowish white; legs white. Primaries white, the costal margin to the end of the cell, the base, and inner

margin pale yellow, the apical third of the wing black; a row of four white spots crosses the wing from near the apex to the anal angle; the fringe black: secondaries pale yellow, broadly edged with black; a marginal row of white spots extending from the apex to the anal angle. Underside the same as above, but rather paler in colour.

Expanse $1\frac{3}{4}$ inch.

Hab. West Africa, Upper Kasai District, Congo Free State (*P. Landbeck*, *Mus. Druce*).

Fam. Nyctemeridæ.

Eohemera albofasciata, sp. n.

Male.—Head and collar bright red; tegulæ black, edged with red; thorax black; antennæ pectinated black; abdomen red, with a black spot on each segment; underside of abdomen and legs yellowish brown. Primaries dark brown, the veins pale brown; a white band crosses the wing beyond the cell from the costal margin to the anal angle; the fringe brownish black: secondaries bright red, the apex and outer margin broadly bordered with black; two black streaks extend from base along the inner margin to the anal angle. Underside very similar to the upperside, but slightly paler in colour.—*Female* very like the male, but larger, the secondaries brighter in colour and shading off to chrome-yellow on the costal margin; the antennæ are simple.

Expanse, ♂ $1\frac{1}{2}$, ♀ $2\frac{1}{4}$ inches.

Hab. West Africa, Bitje, Ja River, Cameroons, 2000 feet, wet season (*G. L. Bates*, *Mus. Druce*).

Allied to *Eohemera fulleri*, Druce.

Fam. Ægeridæ.

Ægeria nobilis, sp. n.

Male.—Head, palpi, antennæ, collar, tegulæ, thorax, and abdomen black; underside of the abdomen and legs brown. Primaries dark brown, palest near the apex; the fringe dark brown: secondaries creamy white, the fringe dark brown. Underside very similar to the upperside, the primaries much paler in colour.

Expanse $1\frac{1}{2}$ inch.

Hab. German East Africa (*Mus. Druce*).

Fam. *Zygænidæ*.*Tassia? amata*, sp. n.

Male.—Head and antennæ black; collar and tegulæ metallic green; thorax, abdomen, and legs glossy black. Primaries black, shaded with metallic red and gold from the base to the end of the cell; the fringe black: secondaries glossy blue-black; a small hyaline spot at the anal angle. Underside of both wings glossy black.

Expanse $1\frac{3}{4}$ inch.

Hab. Abyssinia, Dire Daoua (*G. Kristensen, Mus. Druce*).

LVIII.—*A Revision of the Genus Pelecorhynchus of the Family Tabanidæ.* By GERTRUDE RICARDO.

PANGONINÆ.

PELECORHYNCHUS, Macquart.

Pelecorhynchus, Macq., Dipt. Exot.* Suppl. iv. p. 332 (1850); Loew, Dipt. Südafrik. (1860); Ricardo, Ann. & Mag. Nat. Hist. (7) v. p. 101 (1900).

Cænopyga, Thoms., Eugen. Resa, p. 449 (1868).

The species of this genus are at once distinguished by the hatchet-shape of proboscis, by the curved anal vein of wing and open anal cell, and by the subulated antennæ. The distribution of the species is interesting, the known species all being found in Australia and Chile (S. America). The species now number eight, three of them being described for the first time; only two out of the eight come from Chile.

- | | | |
|---|----|---------------------------------|
| 1. Wings marked with dark spots or bands . | 2. | |
| Wings not marked with dark spots or bands | 4. | |
| 2. The whitish bands of abdomen interrupted, the thorax with two white spots on black stripes | | <i>eristaloides</i> , Walker. |
| The whitish bands of abdomen entire, no spots on thorax | 3. | |
| 3. Spots of wings pale brown, pubescence on anterior part of sides of thorax blackish, hairs on base of cheeks yellow | | <i>maculipennis</i> , Macquart. |

* The original pagination of Macquart's work 'Diptera Exotica' is used throughout this paper.

- Spots of wings deep blackish brown and larger, pubescence on anterior part of sides of thorax and hairs on base of cheeks reddish. *nigripennis*, sp. n.
4. Wings pale russet. Body russet above, black below, with a median dorsal black stripe on dorsum *fulvus*, sp. n.
- Wings hyaline, sometimes tinged yellowish. 5.
5. Abdomen black, shining. Thorax brownish with blackish hairs at sides. Scutellum brown. Legs black *fusciger*, Walker.
- Abdomen reddish brown, shining. Thorax reddish brown, with red hairs at sides. Scutellum brown, with red hairs on posterior border. Legs reddish *claripennis*, sp. n.
- Abdomen, thorax, and scutellum clothed with orange-red pubescence. Legs reddish yellow *aurantiacus*, Ricardo.
- Abdomen, thorax, and scutellum black, with whitish thoracic stripes and spots on abdomen *darwini*, Ricardo.

Pelecorhynchus maculipennis, ♀, Macquart.

Pelecorhynchus maculipennis, Macq., Dipt. Exot. Suppl. iv. p. 332, pl. ii. fig. 6 (1850); Ricardo, Ann. & Mag. Nat. Hist. (7) v. p. 102 (1900).

Silvius personatus, Walker, List Dipt. i. p. 192 (1848), et v. Suppl. i. p. 267 [*Dasybasis*]; Ricardo, Ann. & Mag. Nat. Hist. (7) v. p. 102 (1900).

Pelecorhynchus ornatus, Schiner, Novara Reise, Dipt. p. 98 (1868); Williston, Kansas Univ. Quart. iii. p. 192 (1895).

Black. Abdomen with red bands. Antennæ red. Legs testaceous. Wings with brown spots. Length 6 lines ♂ ♀. Palpi testaceous with yellowish hairs ♂, white ♀. Beard yellowish ♂, whitish ♀. Face on the convex part brownish with black hairs; sides with white tomentum. Forehead brown, with lateral stripes of brown tomentum and a little white tomentum in front, in female. Antennæ: the first two joints and the last four divisions of the third joint brown. Thorax black ♂, brown ♀, with two dorsal black narrow stripes and two slate-coloured stripes the same width, ♀; sides with yellowish hairs ♂, with whitish hairs ♀; a tuft of bright red hairs in front of root of wings. Abdomen, ♂: second, third, and fourth segments with testaceous shining band, interrupted in the middle; posterior border of these segments bordered with short bright red hairs; that of the female differs in these testaceous bands having white tomentum. Legs testaceous, the last joints of tarsi brown; the hairs of the posterior legs black on outside border, brownish on inside border. Wings a little yellowish; the brown spots at base of cells.

From east coast of New Holland. Museum. Macquart, Dipt. Exot. Suppl. iv. p. 332.

Through the kindness of M. Surcouf I was able to see the male and female types of this species in the Paris Museum in the spring of 1908, and was confirmed in my opinion that Macquart in describing the genus was in error in stating that the hind tibiae are unprovided with spines, which are quite distinct in these types, and his drawing of the wing is incorrect, the anal cell being *open*, though narrowed, at border, and the anal vein is curved. This establishes the synonymy of the genus *Cænopnyga* formed by Thomson with Macquart's genus. See my remarks in the 'Annals' (7) vol. v. p. 101 (1900).

I also discovered that *P. personatus*, Walker, is identical with this species and that the specimens I identified as *P. maculipennis* are a new species. From Schiner's description of *P. ornatus*, there is no doubt it is identical with Macquart's species, Schiner being unable to identify it from Macquart's description, though he remarks it is very nearly related. The species is recorded by Macquart from Australia, by Schiner from Auckland, New Zealand, and by Williston from Queensland.

There are specimens in the Brit. Mus. Coll. from Australia (*Hunter*); the Walker type (a female) and males from New South Wales between Sidney and Moreton Bay (*Stutchbury*). In Mr. French's collection sent to me for identification there are males and females from Victoria. The palpi in Macquart's types are small with white hairs, the proboscis hatchet-like, the face convex with small pits on each side. Forehead broad and short with ocelli, pubescence black. Antennæ red, awl-shaped. Eyes bare. Abdomen reddish brown, with three grey tomentose bands on the second, third, and fourth segments, produced in the middle as a roundish spot, the segmentations red-haired. Thorax in male and female blackish, with three indistinct grey stripes. Legs wholly red. Wings hyaline, with a black-brown fore border and three pale brown-coloured bands of spots—the first at the base of basal cells; the second extending from the fore border of wing over the middle cross-veins to the fifth longitudinal vein; the third is divided into spots, so that the anterior one is situated in the middle of the second longitudinal vein, with the second spot almost joining it, lying round the base of the fork of the third vein, and a third quite isolated spot is present at the apex of discal cell; besides these spots, the apex of second longitudinal vein and upper branch of third longitudinal vein

have a spot-like brown shading, and a similar shading is seen on the conspicuously curved axillary vein. The description of the wings is taken from Schiner's excellent description. In Walker's type an extra brown spot is present on the vein dividing the second and third posterior cells, and a faint one is discernible on the apex of fifth longitudinal vein : these are not present or are very faint on the other specimens. The fourth posterior cell is much narrowed, but open at border, in this species.

Pelecorhynchus eristaloides, ♂, Walker.

List Dipt. i. p. 193 [*P. Silvius*] (1848), et v. Suppl. i. p. 267 [*Dasybasis*] (1854); Ricardo, Ann. & Mag. Nat. Hist. (7) v. p. 102 (1900).

Type (♂) and another male from Australia (*Children Coll.*), and a female from S.E. Tasmania (*E. D. Atkinson*).

This species is nearly allied to *Pelecorhynchus maculipennis*, Macq., but distinguished by the white tomentose bands on the second, third, and fourth segments of abdomen being interrupted in the middle and by the presence on the thorax of two striking elongated white spots, each situated on a black stripe which reaches the whole length of the greyish-brown thorax. In the male the hairs on the face are black and thick. Beard yellowish. In male and female the hairs at sides of thorax are black, reddish at base of wings. Markings of wings very similar to those of *P. maculipennis*, but the median band of brown spots is narrower, and the two spots on the second and third veins are widely separated, that on the second vein being nearer base of vein, below the half length of vein; the apex of wing is brownish, so that the apical spots are not distinct.

Length of type and other specimens varies from 15–20 mm.

Pelecorhynchus nigripennis, ♂ ♀, sp. n.

Type (♂) from New South Wales; type (♀) from Dandenong Ranges, Victoria (*French Coll.*); ♀ from Tasmania (*M. Allport*); a ♂ in Mr. French's collection from Victoria.

These specimens, which I at first took to be Macquart's species before seeing the type, have not been described before.

They are nearly related to *P. maculipennis*, but are distinguished from it by the deep blackish-brown markings on wings, which are also larger. The base of wings is more widely dark, extending to the posterior border and joined by

the dark fore border to the middle band of spots, which in this species is wider and extends to the posterior border of wing, and has an almost straight basal border, the upper border a little sinuous, but not so irregular as in Macquart's species; the spots of second and third vein are here completely joined, reaching from the fore border across the base of fork of third vein, sometimes reaching the fourth vein, both borders nearly straight; the spot at apex of discal cell is present, and also the two apical spots, which are joined. Red hairs are visible at base of cheeks, on sides of thorax, and a tuft on breast, besides the usual segmentations of abdomen and border of scutellum. The colouring of thorax and abdomen is darker, being blackish brown, with the same grey tomentose bands.

Length of type about 18 mm.

Pelecorhynchus fulvus, ♀, sp. n.

Type (♀) and two others from Alps, Victoria, Australia (*French Coll.*).

This handsome well-marked species will be easily identified by the bright russet colour of the thorax, abdomen, and wings, and by the black legs with yellow tarsi; there is a black dorsal line on the abdomen and the apex of the wings is clouded with black.

Length 16 mm.

Face black, very convex, shining, bare, divided from the cheeks by deep furrows, the cheeks covered with grey tomentum and with a few black hairs. Palpi brown, the last joint egg-shaped, with black pubescence and a few white hairs below. Beard white.

Antennæ black, the second joint fulvous, the first two joints with black hairs. Forehead about as broad as it is long, black, with a band across the middle of yellowish-brown tomentum; pubescence black. Thorax bright russet, with same coloured pubescence; the sides of dorsum black, with blackish pubescence and a few white hairs above the wings; sides and breast black, with long white-haired tufts. Abdomen bright russet, with short imperceptible red pubescence; the sides of dorsum black, corresponding with sides of thorax, and a median black stripe extends almost to the apex, reaching halfway across the fourth segment; sides with black hairs, white hairs on the first two segments; underside black. Legs black, the tarsi pale yellow, with yellowish-white pubescence; elsewhere the pubescence is black. Wings pale

russet, dark brown at apex, not reaching the extreme apex, most intense round the second and third veins on their apical third, extending as a lighter shade in the submarginal, all posterior, and the discal cells, and on the apical half of the second basal cell; all cells open, the anal vein curved; the alulae brown, fringed with white hairs. Halteres brown.

Pelecorhynchus fusconiger, Walker.

List Dipt. i. p. 192 (1848) [*? Silvius*], et v. Suppl. i. p. 267 (1854) [*Dasybasis*]; Ricardo, Ann. & Mag. Nat. Hist. (7) v. p. 102 (1900).

Type (♀) from Australia (*presented by Lord Derby*) (1844), and another female from New South Wales (*J. J. Walker*) (1904); males from Australia (*Hunter*) and New South Wales, between Sidney and Moreton Bay.

A species with wings clear, tinged yellowish; the thorax brownish; abdomen shining black. Legs blackish.

Length, females 16–18 mm.; males 16–17½ mm.

Face blackish, covered with yellowish-grey tomentum, convex, divided by deep furrows from the cheeks; in the centre on the raised part it is reddish brown, pubescence on face black. Beard yellowish. Palpi reddish, with long black hairs, the second joint egg-shaped.

Antennae reddish: the first joint blackish, with black hairs; the second pale reddish, with some black hairs. Forehead nearly as broad anteriorly as it is long, slightly narrower at vertex, yellowish brown with black pubescence and indications of two narrow brown stripes; ocelli shining, blackish brown.

Thorax same colour as forehead, with black pubescence, some yellowish hairs on basal part; sides with black hairs above and denser pale yellowish hairs beneath them on the posterior half only. Breast blackish, with some brownish tomentum and black hairs; a dense tuft of pale yellow hairs at base of wings. Scutellum similar to thorax, fringed with dull fulvous hairs.

Abdomen black, shining, with traces of whitish or greyish pubescence. Legs blackish, the anterior and middle tibiae and tarsi dull reddish yellow.

Wings clear, veins reddish yellow, slightly tinged with yellow on fore border.

Male identical; the eyes meet, facets all equal; upper part of face below antennae covered with dense black pubescence, the hairs long.

Pelecorhynchus claripennis, ♀, sp. n.

Type (♀) from Dandenong Ranges, Victoria, Australia.

This species is allied to *P. fusconiger*, Walker, but differs in the presence of bright red hairs on the sides of the thorax, on the scutellum, and on abdomen, and the legs are reddish, not black.

Brown, with quite clear wings. Legs yellowish red.

Length 15 mm.

Face convex, divided by deep furrows from the cheeks, reddish brown with black pubescence, the cheeks with some grey tomentum, which also appears on the face. Palpi reddish, the second joint egg-shaped, with long yellowish hairs at apex. Beard pale yellow. Antennæ destroyed except the first joint, which is reddish with black hairs. Forehead broad, nearly as broad anteriorly as it is long, narrower at vertex, brown with short black pubescence. Ocelli present. Thorax brown, covered with fulvous pubescence, a few darker hairs intermixed; posterior border and sides of thorax dull yellowish red, with deep red hairs at base of wing and on posterior border; breast reddish brown, with black hairs and a large tuft of cream-white hairs below wings. Scutellum same as thorax, with deep red hairs on posterior border. Abdomen reddish brown, shining, with scanty black pubescence on dorsum and deep red hairs fringing the hind borders of the last three segments; sides with some black hairs and deep red hairs, the latter most numerous at apex; underside brown, with black hairs and a fringe of red hairs on second and third segments. Legs red; the femora brown, with grey tomentum and white hairs on the anterior pair, black on the others; femora and tibiæ fringed with black hairs; on upper side of middle and posterior femora the hairs are yellowish. Wings hyaline, veins yellow, all cells open, the anal vein curved.

Pelecorhynchus darwini, Ricardo.

Ann. & Mag. Nat. Hist. (7) v. p. 102, pl. i. fig. 1 (1900).

Dr. Kertész sent me for identification a male and female from Concepcion, Chile, which are identical with the above type from Chiloe, S. Chile, with the exception of the white spots on abdomen, which in these are six in number, two each on the second, third, and fourth segments; in the type these are only visible on the third and fourth segments of the dorsum, though they all appear on the underside of abdomen.

Pelecorhynchus aurantiacus, Ricardo.

Ann. & Mag. Nat. Hist. (7) v. p. 103, pl. i. fig. 2 (1900).

This species, also from Chile, is at once distinguished by the dense orange-rufous pubescence on the body.

All the types are in the British Museum collection, with the exception of the Macquart types, which are in the Natural History Museum, Paris.

LIX.—*Descriptions and Records of Bees*.—XXVIII.

By T. D. A. COCKERELL, University of Colorado.

Anthophora darwini, sp. n.

♂.—Length 10 or 11 mm.

Black, the hair of head and thorax above mixed bluish white and black, below white. Eyes very large; facial quadrangle much longer than broad; labrum (except a spot at each basal corner and the linear apical margin), basal two-thirds of mandibles, clypeus (except a large foot-shaped mark, with long heel, on each side above), space between clypeus and eyes, a broad low triangular supra-clypeal mark, and scape in front, all *yellow* (reddened by cyanide in type); flagellum ferruginous beneath. Maxillary palpi 6-jointed: the second joint very large and robust, with a comb of numerous short bristles on its anterior side, and a few much longer ones (two near the middle and two apical), as well as some minute ones, posteriorly; apical joint very slender, with a pair of small apical bristles; length of joints in μ : (2) about 595, (3) 270, (4) 185, (5) 85, (6) 100. Tongue long, *covered with flattened spatulate hairs*, which are about 220 μ long and 30 wide. Tegulae dark reddish; wings dusky; legs with white hair on outer side, and black on inner, hair of hind tarsi entirely black. Abdomen with five broad apical bands, which are *bright shining blue*, reminding one of the colour of some *Lycænid* butterflies; last ventral segment shining, with a strong median keel.

Much like *A. walkeri*, Ckll., but the colour of the abdominal bands is quite different, without any tinge of green. The spatulate hairs of the tongue are also found on *A. pulchra*, Smith (specimen from F. Smith's collection), and doubtless other allied species. They are found even in the American

A. montana, Cresson, &c., though not so conspicuously developed.

Hab. Port Darwin, Australia, Nov. 1902 (*Turner*). Type in British Museum.

Anthophora cingulifera, sp. n.

♀.—Length about 14 mm.

Robust, black, the hair of head and thorax above mixed black and bluish white; labrum (except two large basal spots connected by a line and linear apical edge), basal half of mandibles, reversed **T** on clypeus and lower lateral corners broadly, very broad and low supraclypeal mark, lanceolate lateral marks only touching orbits basally, and small mark on scape in front, all *yellowish white*; flagellum ferruginous beneath; tegulæ dark reddish; wings dusky; abdomen with four broad apical bands, shining brilliant blue.

Hab. Dehra Dun, U. P., India, Nov. 1907 (*Lt.-Col. F. W. Thomson*).

I give only a brief description, as the species has been fully described by Bingham (*Hymenop. British India*, i. p. 526) as *A. cingulata* (Fabr.). I have previously (*Ann. & Mag. Nat. Hist.*, Oct. 1905, p. 397) called attention to the fact that true (Australian) *cingulata* is a different species. The type of the new species is in the British Museum.

Anthophora vulpina waltoni, subsp. n.

♀.—Length 12–13 mm.

Appearance and structure of *A. vulpina*, Panzer (specimen from Nassau, F. Smith collection, compared), but paler without any evident yellowish tint, the apex of abdomen with pale hair like the rest, except the middle of the fifth segment, where it is dark reddish brown. Hair of head and thorax long, dull white mixed with black above, white below; clypeus, labrum, and mandibles black; labrum quadrate, coarsely sculptured, strongly shining; clypeus well punctured, with a median raised line; tongue with well-developed spatulate hairs; antennæ entirely black, joints measuring in μ on under side: (3) 730, (4) 220, (5) 240, (6) 255; tegulæ very dark reddish brown. Wings dusky hyaline; first r. n. joining second s.m. beyond middle; b. n. little bent at base. Hair of legs dull white, pale reddish on inner side of tarsi, brush at end of hind basitarsus fuscous; spurs yellowish white; hind margins of abdominal segments narrowly hyaline, the second to fourth with broad shaggy bands of

greyish-white hair, the surface otherwise with appressed greyish-white hair, with long suberect black hairs intermixed.

Hab. Lhasa, Tibet, "viii. ix. 04, Tibet Exped." (*H. J. Walton*). In British Museum.

These bees are of unusual interest on account of the locality. They prove to be quite different from all the Himalayan species recorded by Bingham and Nurse, and also from the species of the Filchner expedition reported on by Friese. On the other hand, they are so close to the European *A. vulpina* that they seem to be only a pale desert race, though it is possible that the male would show more striking differences. They do not accord with any of the members of the *A. vulpina* group described from Turkestan: *A. plebeja*, Morawitz, differs by the dull labrum and testaceous tegulæ; while *A. flavescens*, Fedts., and *A. murina*, Fedts., both have "tegulis calcaribusque testaceis."

Anthophora persicorum, sp. n.

♀.—Length about 14 mm.

Agrees with *A. quadrifasciata*, Villers, in nearly all respects, but differs thus: clypeus creamy white, with only an oblique quadrate black mark on each side above; antennæ dark reddish, the flagellum ferruginous beneath; hair of head above dull white instead of fulvous, and that of thorax doubtless also pale, but worn off on the type except at sides; hair-bands of abdomen rather broader and clear snow-white; wings distinctly darker. The hind legs are quite as in *A. quadrifasciata*, the hind tibia white-haired on the outside, the hind basitarsus entirely black-haired. The legs are more or less reddened, and the femora have sooty hair beneath. Tegulæ pale testaceous; spurs dark reddish.

The *A. quadrifasciata* compared is from Oran. The Persian insect is perhaps only a local subspecies; it looks very distinct, but has no important characters. It exactly agrees with the description of *A. furinosa* except as to the hair of the legs. I have been through all the descriptions of Asiatic species allied to *quadrifasciata* and find nothing identical.

Hab. S.W. Persia (*Escalera*). In British Museum. The specimen is also labelled "K. Sefid."

Anthophora zonata (L.).

This beautiful species has been reported from many of the Malay islands, including Borneo, Java, Celebes, New Guinea,

Aru Isl., &c. It ranges south into Australia, and I have a specimen from China which I cannot distinguish from the Australian examples. Nevertheless, in the moist tropical islands of the Malay Archipelago it has developed several distinct forms, which are probably constant and for the most part confined to particular islands. Material for the satisfactory presentation of the matter is wanting, but the following specimens are in the British Museum :—

- (1) *A. zonata whiteheadi*, subsp. n., ♀. Cape Engano, Luzon, Philippine Islands (*Whitehead*).—Expanse about 20 mm.: abdominal bands pure deep purple, without any trace of green; hair on outer side of hind tibiæ creamy white, with a dark fuscous basal patch; thorax unusually small.
- (2) *A. zonata borneensis*, subsp. n., ♂. N.W. Borneo; "Spitang R." (95-226).—Expanse 21 mm.: abdominal bands blue, tinged with green, strongly metallic; hair on outer side of hind tibiæ mostly black anteriorly and white posteriorly, without any yellowish or fulvous; last ventral segment keeled.
- (3) *A. zonata andrewsi*, subsp. n., ♂. Tjigombong, Java (*C. W. Andrews*).—Expanse about 20 mm.: abdominal bands metallic yellowish green, with coppery tints; hair on outer side of hind tibiæ light fulvous, with a white apical brush. The hair on head and thorax above is bright fulvous mixed with black, whereas in *borneensis* it is dull and rather greenish mixed with black, giving a general blackish effect. The tegulæ in *borneensis* are very dark, with a slight coppery lustre; in *whiteheadi* they are dull but not dark ferruginous; in *andrewsi* they are as in *whiteheadi*.

Two females of *andrewsi* come from N.W. Borneo (95-226). One of these, labelled Spitang R., April 1895, has expanse nearly 24 mm., and colours exactly as in *andrewsi*; the hind tibiæ have light fulvous hair on the outside, with a basal black streak. The other, from Kina Balu, is rather smaller, and the abdominal bands are a more brilliant, distinctly peacock-green. There is, however, no important difference. All these insects have the wings strongly dusky.

The occurrence of *andrewsi* in Java and Borneo, and of both *andrewsi* and *borneensis* on the Spitang River, is contrary to expectation, and may indicate

either that these insects are different species, or are dimorphic forms of one.

- (4) *A. zonata ternatensis*, subsp. n., ♀. Ternate, "92-44, 6106." Similar to *andrewsi*, but the strongly metallic bands narrower and bluer green; band on first segment very narrow, hardly half as broad as in *andrewsi*; hair on outer side of hind tibia (also basitarsus) brilliant fulvous, with no black basal streak. Tegulæ dull ferruginous. Light mark on scape reduced to an obscure spot.

A. borneensis is very like the Australian *A. darwini*, but is larger and more robust, with a strong yellowish tinge in the thoracic pubescence (wanting in *darwini*), while the clypeal black marks are larger and of the usual *zonata* type. There can be little doubt that they are quite independent derivatives of the *zonata* stock.

Anthophora cincta (Fabr.).

♀.—Clypeus with inversed nail-shaped yellow mark; hair of head and thorax mixed yellowish green and black; splendid shining bright metallic-green bands on abdomen.—Obuasi, Ashanti (*Graham*). Cambridge University Museum.

Pasites maculatus, Jurine.

♂. Cyprus (*C. Glaszner*). British Museum.

Anthophora bipartita, Smith.

Sterkfontein, Transvaal (*H. P. Thomasset*). British Museum.

Anthophora pulcherrima, Bingham, var. *a*.

♂. Khamba Jong, Sikkim, 15,000-16,000 ft., 15-30. vii. 03; Tibet Exped. British Museum.

The specimen differs from Bingham's description in having black hair on each side of the face, especially near the antennæ; it also has a supraclypeal mark (transverse band), and lateral face-marks represented by a light streak on each side of the clypeus. The hind basitarsus has a broad obtuse tubercle on the anterior side beyond the middle, and the hind spur is curved at end.

Anthophora megarrhina, sp. n.

♀.—Length about 19 mm.

Black, wholly without light tegumentary markings; pubescence black, except as follows: on face and vertex

ochraceous, though black on front; on cheeks below long and white, though broadly black next to eyes; on mesothorax anteriorly dark red, and laterally reddish mixed with black; on hind part of thorax dull white; a little white sublaterally on first abdominal segment; third and fourth segments with shaggy apical bands of dull white, that on third interrupted in middle; ventral surface with more or less long white hair; anterior femora below with long shining white hair; middle tibiæ apically in front, and outer surface of their basitarsi, with glittering white hair; hind tibiæ and tarsi on outer side with glittering white hair, but hind margin of tibiæ with black; anterior tarsi with yellowish hair on inner side. Hind femora ferruginous (tegument) behind. Clypeus greatly produced, shining and strongly, but not densely punctured, keeled in the middle, the keel ending in an obscure fork some distance before the lower margin; labrum shining, very coarsely and strongly sculptured; malar space very large; antennæ entirely black, third joint slender, considerably longer than the next three combined; disc of mesothorax shining, with scattered punctures, sides densely and minutely punctured; tegulæ piceous. Wings moderately dusky (about as in *A. hispanica*); b. n. going basad of t.-m.; first r. n. joining second s.m. considerably beyond middle; legs normal.

Hab. Khamba Jong, Sikkim, 15,000–16,000 ft., 15–30. vii. 03; Tibet Exped. British Museum.

Anthophora megarrhina soluta, var. nov.

♀.—Length about 20 mm.

Light hair of head reduced; hair of thoracic dorsum practically all black, but a few reddish hairs intermixed in front, and metathorax behind wings with long white hairs; abdomen without light hair-bands; hair on outer side of hind legs blackish. A mere variety of the last, with the hair nearly all black except on lower part of face, where it is dull yellowish.

Hab. Gyantse, 13,000 ft., June 1904; Tibet Exped. (*H. J. Walton*). British Museum.

The male of this species is represented by two specimens, which come from the type locality, but have the dark hair of the variety.

♂.—Similar to the female except for the usual sexual characters; hair black, except some pale overlapping supra-clypeal area, a white patch on each side of clypeus apically, long white hair on lowermost part of cheeks, some white behind wings, and a certain amount of pale hair on legs; mandibles black; labrum cream-colour except a large brown

spot on each side; clypeus trilobed, yellow except lateral sutural stripes and linear lower edge; a transverse supra-clypeal band, lateral marks (filling space between clypeus and eye, except that they are more or less excavated above), and scape in front also yellow; eyes greenish, prominent; tongue and labial palpi very long (tongue fully 12 mm.); projecting apex of second joint of labial palpi with a conspicuous brush of red hair; pulvilli with two teeth or horns; middle tarsi ordinary; hind basitarsus not toothed; apical plate of abdomen emarginate.

Hab. Khamba Jong; all particulars as in type.

In Friese's tables ('Die Bienen Europa's') this runs nearest to *A. vernalis*, but is quite distinct. It is not like any of the described Indian species.

Anthophora khambana, sp. n.

♀.—Length 15 mm.; expanse 26.

In appearance closely resembles Bingham's figure of the female of *A. pulcherrima*, having the same ochreous hair on thorax and base of abdomen, and the same bright red hair covering the abdomen beyond. It is evidently close to *pulcherrima*, but differs as follows:—Hair of head, pleura, and under side of thorax entirely black; sides and apical segment of abdomen with black hair; hair of legs black, reddish on inner side of anterior tarsi. Malar space well developed, about twice as broad as long; labrum shining, with irregular deep punctures; clypeus strongly punctured, not keeled; antennæ black, third joint fully as long as the three following; tegulæ dark reddish. Wings moderately dusky; b. n. meeting t.-m. Hind spurs ferruginous, curved at end. The abdomen has a subapical tuft of white hair on each side beneath.

Hab. Khamba Jong, Sikkim, 15,000–16,000 ft., 15–30. vii. 03; Tibet Exped. British Museum.

Anthophora orophila, sp. n.

♀.—Length about 14 mm.; expanse about $23\frac{1}{2}$.

No light tegumentary markings; hair of head except vertex, pleura, ventral surface, legs, and dorsum of abdomen beyond second segment black; hair of vertex, thorax above, and first two segments of abdomen yellow, becoming a lively orange on second abdominal segment; malar space well developed; labrum very coarsely sculptured; clypeus well punctured at sides, but very sparsely in middle; third antennal joint as long as the three following together; tegulæ

ferruginous. Wings moderately dusky, b. n. going basad of t.-m. Spurs and small joints of tarsi ferruginous. The coloration of the abdomen agrees with that in *A. himalayensis*, Rad., but the hair on the legs is differently coloured, the clypeus is not carinate, &c. The marginal cell is shorter and the first r. n. joins the second s.m. further beyond the middle than in *A. khambana*.

Hab. Khamba Jong, Sikkim, 15,000–16,000 ft., 15–30. vii. 03; Tibet Exped. Brit. Museum.

Bombus sumatrensis, Ckll., var. *ardentior*, nov.

♀.—Length about 17 mm.

Structure as in *B. sumatrensis*: hair of face, front, vertex, and cheeks entirely black; of labium reddish black; of thorax above yellowish white; of abdomen black, on fourth and fifth segments rather dull ferruginous. A colour-variety only, with the abdominal band red instead of yellowish white.

Hab. Sumatra, "x. 1, 5. 81." British Museum, 92. 182.

Bombus irisanensis, sp. n.

♂.—Length about 14 mm.; expanse 31.

Black, the hind tibiæ and tarsi and small joints of other tarsi obscure reddish; hair of head all black except a little reddish on labrum and mandibles; hair of thorax above entirely black, but on pleura fulvous; first two segments of abdomen entirely and densely covered with bright yellow hair (a rather fulvous yellow), the others with black, and the venter also with black; legs with black hair. Wings ample, deep fuliginous, but still transparent enough for print to be easily read through them. Clypeus convex, smooth and shining in the middle, punctured at sides; malar space longer than broad; a red tubercle at base of mandibles; ocelli very small; third antennal joint about as long as fifth.

Structurally this much resembles *B. sumatrensis*, but the colours are entirely different. The colour will also readily distinguish it from the Philippine *B. mearnsi*, Ashmead. In the colour of the wings it resembles the Chinese *B. hæmorrhoidalis*, Sm., but that has a short malar space and many other differences.

Hab. Irian, Benquet Prov., Luzon, Philippine Islands, May 28. British Museum, 1906–44.

Bombus rufipes, Lep., var. *melanopoda*, nov.

♀.—Length about 25 mm.; anterior wing 18.

Robust, black, with black pubescence, that on apex of

labrum ferruginous; legs black, the hind tibiæ very dark reddish. Wings dark.

Similar to *B. rufipes*, but distinguished by the dark black-haired legs. The difference is not absolute, as the hind legs have many of the long tibial hairs orange-tipped and the hair on the inner side of the basitarsus is wholly dull ferruginous. *B. rufipes*, var. *obscuripes*, Friese, from Java, has dark hair on the legs, but the legs themselves are clear red.

F. Smith compares *B. rufipes* with *B. eximius*, Sm., noting the important colour-differences. The Sumatran specimen now before me also differs structurally, having the third antennal joint longer and the clypeus and malar space very much longer. In the long malar space, the long clypeus, shining on the disk, the bituberculate labrum, &c. it agrees with the other Sumatran forms, from which it differs totally in coloration.

Hab. Sumatra. British Museum, 92. 182.

Bombus tunicatus, Smith.

Baltistan. British Museum, 88, 31.

In a worker from Simla (F. Smith's collection) and one of those from Baltistan the second abdominal segment is covered with reddish hair, the third with black, after which follows the bright red band. In the other Baltistan example the second and third segments are covered with black, except that the second has a little red at base. The black thoracic band is inclined to be evanescent laterally and in the first Baltistan specimen is reduced to a few hardly noticeable black hairs.

This species is evidently variable, and I am inclined to think that *B. gilgitensis*, Ckll., is a variety of it.

B. terrestris, var. *fulvocinctus*, Friese and Wagner, 1909, from Simla, is evidently *B. tunicatus*. *B. terrestris*, var. *simlaënsis*, Friese and Wagner, 1909, is intermediate, at least in colour-pattern, between *tunicatus* and *gilgitensis*.

Gronoceras felina (Gerst.).

Megachile felina must be referred to *Gronoceras*, although the male flagellum is not wholly characteristic. The abdominal spines of the male are quite normal for the genus; the anterior coxæ each have two spines, one long and obtuse, the other short and sharp.

Mayotte, Comoro Is., from Berlin Museum; Katanga District, Congo Free State (*Dr. A. Yale Massey*), British

Museum. The latter, a female, has ventral scopa ferruginous, whitish at sides, black on last segment.

Cælioxys turneri, sp. n.

♀.—Length $10\frac{1}{2}$ mm.

Black, with bright chestnut-red tegulæ, strongly dusky wings, and *narrow bright red hair-bands on the hind margins of the abdominal segments*. Hair of eyes rather long; face with appressed yellowish-grey hair, a conspicuous ochreous tuft under each antenna; vertex, mesothorax, and scutellum with extremely large punctures, as dense as possible; hair of occiput, upper part of metathorax, &c. reddish brown, of pleura and cheeks dull white; mesothorax and scutellum with a delicate poorly developed median raised line; scutellum not tuberculate in the middle, lateral teeth well-developed, a little curved inwards; last dorsal abdominal segment delicately keeled, not greatly elongated; last ventral produced far beyond last dorsal, turned downwards, narrow, notched on each side before the end; first three ventral segments with large well-separated punctures, fourth with smaller punctures. The structure of the end of the abdomen is nearly as in *C. elongata*, Lep., but the subapical notches are smaller and the last ventral is more evidently conical in outline.

♂.—Similar, with the same red bands. Face densely covered with yellowish-white hair, but that just beneath the antennæ and also that on the eyes ochraceous; abdomen with a small tooth on each side of penultimate segment, a long red tooth on each side of last segment, and the usual four black apical teeth, the lower ones much longer than the upper; ventral segments with fringes of pure white hair, the first with the hind margin broadly red (tegument) and only a little white hair in the middle; anterior coxæ with long spines.

Hab. Shillong, Assam, June and July 1903 (*R. Turner*).

A very distinct species, easily known by the red abdominal bands. Mr. Turner had already recognized that it was new.

Euglossa ignita, Smith.

Ecuador (*Rosenberg*). British Museum.

Euglossa cordata (L.).

Jamaica (*Mrs. Swainson*). British Museum.

Ceratina chalcites, Latr., var. *a*.

Female with no light spot on clypeus.

La Sagra, Granada (*Escalera*). British Museum.

Ceratina binghami, Ckll.

Dehra Dun, U. P., India, Nov. 1907 (*Lt.-Col. F. W. Thomson*). British Museum.

Crocisa luzonensis, sp. n.

♀.—Length about 12 mm.

Wings very dark; light markings blue; scutellum of the **W**-type, but the notch not deep and its sides slightly undulating, so that it is rather intermediate between the two types; face with blue hair; a strong keel between antennæ; vertex shining; mesothorax with a **T** and two spots in pale bluish, not strongly marked; pleura with a band of blue hair; hair of scutellum all black; tibiæ (the basal half of hind tibiæ only) and tarsi blue-haired on outer side. Abdomen with entire blue bands, which are exceedingly brilliant but not metallic; the first segment is blue except the hind margin and a large quadrate basal patch.

Hab. Irian, Benquet Prov., Luzon, Philippine Is. British Museum, 1906-44. Collected May 30.

This species will be further discussed in connexion with other Malayan members of the genus.

Boulder, Colorado.

March 31, 1910.

LX.—*Three new African Rodents.*

By OLDFIELD THOMAS.

(Published by permission of the Trustees of the British Museum.)

Euxerus erythropus mæstus, subsp. n.

A very dark-coloured form of the common *E. erythropus*.

General colour above dark brown—like Prout's brown, but darker,—very different to the more or less ochraceous or clay-coloured tone of *E. erythropus*. Pelage thin and scanty, the hairs, or, rather, spines, blackish, with minute whitish or buffy tips. Crown blackish. Flanks below lateral line as

usual blackish, but so dark is the general colour that there is little difference between the back and flanks. Under surface greyish buffy. Hands and feet greyish brown, with a slight tinge of buffy. Tail hairs ringed with black and dull buffy white, some of them with tawny bases.

Hab. Daru, 150 miles inland, Sierra Leone.

Type. Male. B.M. no. 7. 7. 15. 4. Collected and presented by Capt. L. Murray, of the East Surrey Regiment. Two specimens.

Dipodillus brockmani, sp. n.

Smaller than *D. somalicus*, with smaller teeth but larger bullæ.

Size decidedly smaller than in *D. somalicus*, the only known Somali species of *Dipodillus*. General colour rather paler sandy than in that animal. No darker nose-spot. A small white spot above each eye. Lighter patches behind ears not very conspicuous. Fore limbs pure white, the line of demarcation passing over the shoulder. Tail long, greyish white, not sandy above, white below; terminal crest little developed, its longest hairs about 8–9 mm.

Skull differing from that of *D. somalicus* in the direction of *Microdillus*, being a little more bowed above, and with the bullæ surpassing the occiput posteriorly. Interorbital region not especially narrowed. Cranium convex above. Anterior palatal foramina shorter than in *somalicus*. Bullæ very large for a *Dipodillus*, larger than in the larger *D. somalicus*, closely approximated in the median line anteriorly, and projecting posteriorly beyond the occiput, a considerable portion of this visible in an upper view of the skull. Teeth exceedingly small.

Dimensions of the type (measured in the flesh) :—

Head and body 76 mm.; tail 117; hind foot 21; ear 11.

Skull: greatest length 25; basilar length 17·5; nasals 9·5; interorbital breadth 4·8; breadth of brain-case 12·5; anterior palatine foramina 4·7; greatest horizontal diameter of bulla 10; upper molar series 3·1.

Hab. Somaliland. Type from Burao, 85 miles S. of Berbera.

Type. Adult female. B.M. no. 10. 3. 27. 21. Original number 255. Collected 21st December, 1909, and presented by Dr. R. E. Drake-Brockman. Two specimens.

This little Gerbil, which was recognized as new by its captor, and is named after him, is readily distinguishable from any of its allies by its comparatively large bullæ, which

project backwards from the skull in a manner quite unusual in *Dipodillus* and more reminiscent of *Microdillus*. *D. watersi*, however, in a lesser degree shows something of the same character, but is distinguished by its narrower brain-case and smaller bullæ.

The present is the *Dipodillus* referred to on p. 122 of Dr. Drake-Brockman's 'Mammals of Somaliland,' and *D. somalicus* that on p. 121.

Tachyoryctes audax, sp. n.

A fairly large fulvous form, with particularly large teeth.

Size of old specimens about as in *T. ibeanus*. Skull with the nasals long, with scarcely a trace of lateral reentrant concavities, attaining behind a line almost exactly level with that of the ends of the premaxillary processes or a little short of them. Zygomata of about normal expansion and length, the distance from the anteorbital notch above to that behind the squamosal in front of the meatus about 21·5 mm., markedly less than in *storeyi* (22·5), more than in *badius* (20). Sagittal crest linear, well developed. Bullæ larger than in *ibeanus*. Molars very large, the transverse oblique diameter of m^1 along its anterior lamina commonly attaining 4 mm., and always greater than in the allied forms.

Colour dark fulvous, plumbeous individuals very rarely found. Head but rarely darkened. Feet pale brown above.

Dimensions of the type (measured in the flesh):—

Head and body 205 mm.; tail 59; hind foot 29.

Skull: condylo-basal length 48·2; greatest breadth 35; nasals 19·3 × 6·6; brain-case 20 × 20·2; upper molar series 10·2; length of bulla 11·3.

Hab. Top of the Abudare Range, British East Africa. Type from 10,000'.

Type. Adult female. Rudd Collection. Original number 596. Collected 5th February, 1910, by Robin Kemp. Seventeen specimens.

This mole-rat, of which the series sent home by Mr. Kemp is remarkably uniform, seems most nearly allied to *T. ibeanus* of Machakos, but differs by its conspicuously larger teeth, longer nasals, and larger bullæ. From *T. storeyi** it is

* By some accident I find I have given condylo-basal lengths in some of the *Tachyoryctes* described last December, and condylo-basilar in others, while in several cases misprints of these words have also crept in. The condylo-basal lengths of the types of the species described are as follows:—*ankolie* 45·7 mm, *dæmon* 45·2, *ruddi* 45·5, *badius* 46·6, *storeyi* 49·9, *naivashee* 42·2, *spalacinus* 45·6.

distinguished by its normal shaped, not elongated brain-case; from *badius* by its larger size, larger teeth, greater extension of the nasals behind, and longer zygomatic fossæ; and from *rudhi* by larger size, broader nasals, and larger teeth, in addition to its fulvous instead of usually plumbeous colour.

It is not unnatural that the mole-rat of the long summit of the Abudare Range should be a peculiar form. At Naivasha, on his way to the range, Mr. Kemp obtained an example of the much smaller *T. naivashæ*.

LXI.—Notes on some Palm-Civets.

By ERNST SCHWARZ.

THE British Museum possesses a Palm-Civet from Sumba Island, Timor Sea, apparently belonging to a new species, for which I propose the name

Paradoxurus sumbanus, sp. n.

A small Paradoxure with loose fur without frontal band. Skull much like *P. philippinensis*, but cheek-teeth of the type found in *P. hermaphroditus*, Pall., from Southern Malay Peninsula.

Upperside golden yellow, strongly mixed with black, and with a very indistinct blackish dorsal line. (Hairs brownish grey at base, then golden yellow, with black tip, which is very broad in the hairs of the centre of the back and becomes narrower towards the sides of the body.) Crown, ears, muzzle, cheeks, limbs, and tail in its entire length blackish brown. The face-markings consist of a dirty whitish spot on each side of the muzzle (at the base of the whiskers), a small whitish spot on each side below the eyes, and a whitish stripe on each side above the eyes extending nearly to the whitish-yellow whorl in front of the ear. Under side of body dull brownish grey, the hairs of the chest with dirty yellowish tips.

Skull much as in *P. philippinensis*. General form slender; zygomatic arches very wide. Brain-case long and narrow, with a well-marked but short intertemporal constriction as in *P. philippinensis*. Nasals narrow, U-shaped behind. Postorbital process strongly developed. Palate rather narrow, diverging gradually behind. Bullæ medium, pear-shaped, concave medially, strongly inflated laterally, very high vertically. Rostrum slender.

Teeth rather small; premolars all slightly concave behind; carnassial concave behind, with the metacone about as large as the protocone, with small anterior tubercle and no postero-internal ledge.

Type. B.M. no. 97. 4. 18. 1. Old male. Collected by A. Everett in December 1896.

Hab. Sumba Island, Timor Sea.

Dimensions of type (taken on the skin):—

Head and body 470 mm.; tail 405; hind foot 72.

Skull: basilar length 87; condylo-basilar length 92; greatest breadth 58; mastoid breadth 34; nasals 20×9.8 ; intertemporal constriction 12; width of brain-case 32; palatilar length 42; palate, greatest breadth (including teeth) 35, least breadth (between canines and incisors) 10; breadth of rostrum across roots of canines 17; foramina incisiva 5.3; front of p_1 to back of m_2 31; p_4 , length on outer edge 8.1, breadth 6.5, greatest diameter 9.5.

The Sumba *Paradoxurus* is very distinct from every form hitherto described. Externally it somewhat resembles *P. setosus*, Hombr. et Jacq., from Ceram, the skull of which I do not know. It is at once distinguished by its fine colour, its loose fur, and the peculiar shape of its cheek-teeth. The type is an old specimen with high sagittal crest.

In 1885, when writing his monograph of the genus *Paradoxurus*, Blanford united Gray's *Paguma* with it. Recently, however, this genus has been generally recognized. Therefore it becomes necessary to create a new genus for the reception of the Celebes Palm-Civet hitherto known as *Paradoxurus musschenbroeki*, as it presents many striking differences both in the skull and externally. The new genus may be characterized as follows:—

MACROGALIDIA, gen. nov.

Intertemporal constriction well-marked as in *Paradoxurus*. Rostrum constricted behind, wider in front. Bullæ small and flat, and the long paroccipital processes therefore projecting considerably (about 5 mm.). Palate narrow and in consequence of the form of the teeth (see below) parallel-sided, not diverging behind as in *Paradoxurus*; posteriorly it ends abruptly behind the last molars, the lateral processes found in *Paradoxurus*, *Paguma*, and *Arctogalidia* being almost or totally absent as in *Cynogale*. Medially the bony palate is continued considerably backwards, the mesopterygoid fossa being narrow. The posterior opening of the alisphenoid

canal is rather far back and close to the *foramen ovale* (not the *foramen lacerum medium*, as erroneously stated by Blanford, P. Z. S. 1885, p. 806).

Teeth very large; the p_4 , m_1 , and m_2 broader than long, so causing the peculiar shape of the palate, which somewhat resembles that of *Cynogale*. In p_4 the anterior lobe of the blade is as long as the posterior one (metacone), while in *Paradoxurus* it is always shorter; the tooth is convex posteriorly, and has a strongly developed postero-internal ledge.

Externally the new genus is characterized by the short close fur, the annulated short tail, and the whorl in the neck, the hairs of the neck and crown being directed forwards.

In the skull as well as externally the differences which separate this animal from *Paradoxurus* are very striking. The new genus is a further one peculiar to Celebes.

Paguma differs from *Paradoxurus* in having the palate greatly produced behind, in the insignificant postorbital constriction, and the blunt postorbital processes.

LXII.—*Two new Mammals from the Malay Peninsula.*

By OLDFIELD THOMAS.

(Published by permission of the Trustees of the British Museum.)

AMONG the specimens which the British Museum owes to Mr. H. C. Robinson's recent expedition to the northern part of the Malay Peninsula is an enormous *Arctonyx*, very much larger than any known member of the genus and obviously needing description.

It has, however, been known to Mr. Robinson for some time under its native name "*Sabima*," and after much enquiry he succeeded in obtaining the specimen now described.

Arctonyx dictator, sp. n.

Size decidedly larger than in other species. Fur long, coarse, and harsh. General colour above dull buffy, overlaid anteriorly by black, posteriorly by mixed black and greyish. Hairs of the nape and anterior back buffy for their basal, black for their terminal halves, of posterior back buffy for their basal two-thirds, then black with a buffy tip. Scanty hairs of under surface wholly black. Facial markings not

sharply defined, the light mark under the eye subdued by a blackish admixture. Edges of ears strongly buffy. Throat-patch strong ochraceous buffy. Limbs black throughout. Tail dull buffy white.

Skull in general characters agreeing with that of *A. collaris*, but larger throughout. Posterior tubular portion of palate less inflated laterally.

Dimensions of the type (measured in flesh) :—

Head and body 1025 mm.; tail 235; hind foot 122; ear 34.

Skull: condylo-basal length 166; basal length 153; greatest breadth 99; interorbital breadth 40; mastoid breadth 91; palatal length 111; length of p^4 on outer edge 11; greatest diameter of m^1 18.5.

Hab. Lam-ra, Trang, Northern Malay Peninsula.

Type. Old female. Original number 3478. Selangor Museum number 1223/10. Obtained 1st February, 1910, by Museum collector.

The chief feature about this *Arctonyx* is its enormous size, as the specimen looks like a small bear, and, though a female, far exceeds any example, male or female, of *A. collaris* in the Museum collection; and *A. collaris*, in turn, is decidedly larger than the Chinese species *A. leucolæmus* and *A. obscurus* and the Assamese *A. taxoides*.

In describing an *Arctonyx* from this region, however, mention has to be made of Hubrecht's "*Trichomanis hoeveni*"* from Sumatra, at first supposed to be, and described as, an Edentate, but afterwards said † to be an *Arctonyx*. The type was lost, and the description does not apply to any known animal.

Among other things it was said to be of the "size of a very large cat," and *Arctonyx dictator* is many times larger than any possible house-cat. In colour it was "grey with a black band along the middle of the back"—no such coloration is as yet known in *Arctonyx*.

If an *Arctonyx* occurs in "the mountainous districts that separate the Residencies of Palembang and Bencoolen," and its characters are in any way compatible with those of Hubrecht's animal, after elimination of the imaginary Edentate attributes, the name *hoeveni* may have to be used for it. But this is certainly not the case with *Arctonyx dictator*, which is too large, and is quite unlike in colour.

* Notes Leyden Mus. xiii. p. 241 (1891).

† P. Z. S. 1895, p. 522.

Ptilocercus lowi continentis, subsp. n.

Very similar to true Bornean *lowi*, but distinguished by the following characters:—Colour above drab-grey, that of *lowi*, so far as can be seen on rather faded specimens, more tinged with isabella. Underside soiled creamy, fairly sharply defined from the grey sides. Dark eye-mark more extended anteriorly, reaching nearly to the tip of the muzzle. Hands pale buffy above, as in *lowi*, but feet with the metatarsals dark brown, contrasting markedly with the buffy toes. Fine hairs of “naked” part of tail shorter and more sparsely scattered than in *lowi*; proximal half-inch of the plume black, remainder white.

Skull of about the same length as in *lowi*, but the muzzle and palate markedly narrower; the breadth of the muzzle above i^2 is 6.0 mm. in two adult *lowi*, 5.1 in the type of *continentis*; distance between outer corners of m^2 12.1 mm. in *lowi*, 11 in *continentis*.

Dimensions of the type (measured in the flesh):—

Head and body 133 mm.; tail 167; hind foot 26.5; ear 17.

Skull: condylo-basal length 37.3; greatest breadth 22.5; interorbital breadth 8.5; brain-case breadth 15; palatal length 17.7; length of upper tooth-series 17.6.

Hab. 10 miles from Kuala Lumpur, Selangor.

Type. Adult male. B.M. no. 10. 4. 17. 1. Presented by the Selangor Museum. Obtained 22nd December, 1903, by a Museum collector.

“Caught in a nest made of leaves and fibre in a tunnel 2 feet long in a hollow branch of a tree.”

LXIII.—*Some Remarks on the Teleostean Caudal Fin.* By
RICHARD H. WHITEHOUSE, M.Sc., University of
Birmingham.

IN a recent number * of this journal Mr. C. Tate Regan contributed an interesting paper on the caudal fin of some Teleostean fishes, and in the course of his remarks he refers to a recent paper of mine † which gave a summary of somewhat extensive observations on caudal fins in fishes. Mr. Regan says “the caudal fin skeleton of the Clupeidæ differs

* April 1910, p. 354.

† Proc. Royal Soc. B. lxxxii. p. 139.

from that of the Elopidae in that the last two centra have aborted, and the anterior uroneural is ankylosed with the actual last centrum (corresponding to the third last of the Elopidae).” The same author says further:—“I have already mentioned Mr. Whitehouse’s paper on the caudal fin of fishes, and I have shown that the element which he terms ‘urostyle’ in *Clupea* is formed by one or more displaced posterior neural arches or ‘uroneurals’; the homocercal caudal fin should not then be defined by the presence of a urostyle formed by the fusion of upturned vertebræ, but by the modification of posterior neural arches into uroneurals which functionally replace and so lead to the suppression of the centra of the upturned vertebræ.”

From the latter quotation the reader might be inclined to suppose that the ankylosis of a “uroneural” with one of the terminal vertebræ constitutes what I called a urostyle; and for this reason it will be necessary for me to emphasize that I consider a urostyle to be the result of a fusion of vertebral centra only, and that anything of the nature of neural arches does not at all enter into the formation of a urostyle. In the case of *Clupea* I do not think “that the last two centra have aborted,” but that several centra which once formed the upturned portion of the vertebral column have become united and have formed a single rod-like bone or urostyle. A reference to the figure of Mr. E. T. Newton, F.R.S.*, shows that in the young *Clupea sprattus* the upturned part of the axis consists of distinct centra which later on lose their individuality and fuse together to form a urostyle. Moreover, in *Clupea*, the neural arches of the centra which have formed the urostyle still persist in the form of a triangular bone resting upon the urostyle.

I do not consider the persistence of posterior neural arches in the form of “uroneurals” as functionally replacing the centra of the upturned vertebræ, but rather that they persist in order to still carry out their function of protecting the spinal cord, which seems always to extend to the distal end of the last hypural, even when the actual vertebral column terminates at the proximal end of the terminal hypural bones.

With reference to the caudal fin of *Fierasfer*, Mr. Regan finds it impossible to regard it as geophyrocercal, apparently for the reason that the rays which may be considered to constitute the caudal fin are not supported by radials, as the dorsal and anal fins are. The same author considers the

* ‘Journal of the Quekett Micros. Club,’ 1882, ser. ii. vol. i. p. 79.

following to be essential to gephyrocercy: "the posterior part of the tail to have aborted and the interval between the dorsal and anal to have become bridged across by a secondary formation of rays, inserted on basalia and derived from the dorsal and anal fins." Now the caudal fin of *Fierasfer dentatus* fulfils all these conditions except that the rays are not inserted on basalia; this latter condition is one which I have not seen insisted on before; moreover, Ryder quotes *Fierasfer* as illustrating his definition of gephyrocercy, and such eminent authorities as Professors L. Dollo* and B. Dean† consider this form typically gephyrocercal.

According to Mr. Regan's description of the caudal fin of *Genypterus*, viz. that it possesses two expanded hypurals, this form is undoubtedly homocercal. Since this is so, it is fairly safe to conclude that in the larval stages this fin passes through a heterocercal stage; but *Fierasfer* has no hypurals, and according to all records that have been available to me there is no evidence of a heterocercal stage during development. Again, the caudal fin of *Genypterus*, being supported by hypurals, is morphologically a ventral fin, while that of *Fierasfer* is shared by dorsal and ventral rays, and a gap remains between the two halves. For these reasons we are scarcely justified, I think, in considering the caudal fin of *Fierasfer* to be in a "condition somewhat more specialized than in *Genypterus*," which implies that they are to be considered in the same category; on the contrary, it appears to me that *Fierasfer* has a typically gephyrocercal and *Genypterus* a homocercal caudal fin.

LXIV.—*A Preliminary Note on the Alciopinæ, Tomopteridæ, and Typhloscolecidæ from the Atlantic adjacent to Ireland.*
By R. SOUTHERN, B.Sc., Irish National Museum, Dublin.

THE collection of Polychæta made by the Scientific Staff of the Fisheries Branch of the Department of Agriculture and Technical Instruction for Ireland contains a number of species belonging to the above pelagic families. With the exception of the two species *Tomopteris helgolandica* and *T. septentrionalis*, none of them has hitherto been recorded from the British Marine Area. The list of species is as follows:—

* 'Sur la Phylogénie des Dipneustes,' 1895.

† 'Journal of Morphology,' 1894, p. 102.

ALCIOPINÆ.

Vanadis formosa, Claparède.

Greefia celox (Greeff).

Callizona angelini (Kinberg).

— *setosa* (Greeff).

— *nasuta*, Greeff.

TOMOPTERIDÆ.

Tomopteris helgolundica, Greeff.

— *septentrionalis*, Quatrefages (Steenstrup).

— *nisseni*, Rosa.

— *cavallii*, Rosa.

TYPHLOSCOLECIDÆ.

Travisiopsis lanceolata, sp. n.

— *levinseni*, sp. n.

Sagitella kowalewskii, N. Wagner.

Sagitella sp.

Of these species only *T. helgolundica* occurs in the coastal waters and inland seas. The others are found in the European branch of the Gulf Stream, which flows in a northerly direction past the west coast of Ireland.

A full report on this collection will shortly be published in the 'Scientific Investigations' of the Fisheries Branch.

The two new species of *Travisiopsis* are distinguished by the following characters:—

Travisiopsis lanceolata, sp. n.

Length 25–30 mm. Number of body-segments 22. Median dorsal papilla pear-shaped, with free posterior lobe. Lateral tentacles long, reaching as far back as the middle of the fourth segment. Prostomium conical, with filiform tip. Cirri almost square, with narrow area of attachment. Anal cirri powerful, lanceolate. Longitudinal muscles in dorsal and ventral pairs, broad and close together.

Travisiopsis levinseni, sp. n.

Length 20–24 mm. Body much slenderer than in the previous species. Number of body-segments 25. Median dorsal papilla sessile, without the posterior projecting lobe. Lateral tentacles short and thick. In front of these, on each side, is a smaller lobe. Prostomium conical, with filiform tip. Cirri square, with very broad area of attachment. Anal cirri powerful, spatulate. Longitudinal muscles in dorsal and ventral pairs, narrower and further apart than in *T. lanceolata*.

LXV.—*Descriptions of new African Moths.*
By Sir GEORGE F. HAMPSON, Bart., F.Z.S., &c.

Noctuidæ.

PLUSIANÆ.

Polychrysia camptogamma, sp. n.

♀. Head and thorax red-brown mixed with some greyish; tarsi ringed with whitish; abdomen grey suffused with brown, whitish at base. Fore wing grey suffused with red-brown and with slight dark irroration; traces of a silvery streak in base of submedian fold; subbasal line represented by a curved silvery striga from costa; antemedial line represented by an oblique silvery striga from costa and inwardly oblique sinuous silvery line from cell to inner margin; an oblique silvery Y-shaped stigma below end of cell, filled in with greyish and with downcurved silvery streak above it in cell, the inner arm of the stigma sinuous, some golden cupreous suffusion beyond and below it; postmedial line indistinct, strongly bent outwards below costa and incurved below the tail of the Y-shaped stigma, where there is some silvery white on it, some greyish points beyond it on costa and an oblique shade from below costa to its outer edge at vein 4; subterminal line greyish defined on inner side by dark brown from vein 7 to 2, and a wedge-shaped patch in submedian fold excurved to termen at vein 6, then incurved, a dark patch beyond it at middle; a terminal series of black striæ defined on inner side by a greyish line. Hind wing brown with a slight cupreous tinge; cilia greyish with a dark line at base; the underside grey-brown with diffused grey-white medial shade.

Hab. BR. E. AFRICA, Kikuyu, Roromo (*Crawshay*), 1 ♀ type. *Exp.* 34 mm.

Plusia gammaloba, sp. n.

♂. Head and thorax bright rufous mixed with grey; tegulæ with slight dark medial line and white tips; abdomen pale rufous, the basal crest fiery red tipped with grey, the crest on second segment brown tipped with grey. Fore wing bright golden cupreous with slight dark irroration; subbasal line represented by a silvery striga from costa and double striga from cell; antemedial line silvery defined by cupreous brown, excurved below costa, angled inwards in

cell, oblique and sinuous from cell to inner margin; the stigma formed by a small black spot defined at sides by silvery striae above median nervure and a Y-shaped silvery mark below the cell filled in with whitish, its tail bent outwards and dilated into a triangular lobe filled in with silvery white; reniform represented by a silvery striga on upper discocellular, with elliptical cupreous brown mark beyond it and two silvery striae below, forming with the median nervure an incomplete triangle; postmedial line indistinctly double, filled in with silvery grey, obliquely curved and minutely waved from costa to submedian fold, where it is angled inwards, then bent outwards, some grey-white suffusion before and beyond it from costa to vein 3, narrowing below; subterminal line silvery white, excurved from costa to vein 6, then oblique, some grey-white beyond it at middle and in submedian interspace; a fine silvery-white line just before termen; cilia grey-white mixed with cupreous brown. Hind wing cupreous brown, the cilia with fine whitish line at base and white tips; the underside whitish suffused and irrorated with red-brown, an indistinct oblique postmedial line, the area beyond it dark brown with a cupreous gloss.

♀. Abdomen greyer; hind wing darker.

Hab. MADAGASCAR, Betsileo (*Cowan*), 1 ♂, 1 ♀ type.
Exp., ♂ 44, ♀ 40 mm.

Allied to *P. biloba*, Steph.

Plusia tetrastigma, sp. n.

♀. Head, thorax, and abdomen red-brown mixed with grey-white. Fore-wing grey-brown irrorated and striated with dark brown, a large triangular patch of dark red-brown extending obliquely from apex below costa into the end of cell and down to vein 2; traces of a sinuous grey subbasal line from costa to vein 1 and of a sinuous grey antemedial line; an oblique silvery stigma formed by a minute silver lunule above median nervure towards end of cell, a round spot below median nervure almost or quite touching an elliptical spot with another round spot below it; reniform faintly defined by grey and strongly constricted at middle; postmedial line very slight and indistinct, grey, sinuous, angled inwards in submedian fold below the silvery stigma; the veins of terminal area slightly streaked with grey; a fine waved grey subterminal line and fine waved grey line just before termen. Hind wing whitish suffused with reddish brown especially on terminal area; cilia whitish, with a brown line through them; the underside whitish irrorated with

brown, the terminal area suffused with brown, a brown discoidal lunule and faint subterminal shade.

Hab. TRANSVAAL, White R. (Cooke), 1 ♀; NATAL, Durban (Bell-Marley), 1 ♀ type. *Exp.* 34 mm.

Nearest to *P. aranea*, Hmps. n.

Plusia argyrodonta, sp. n.

♂. Head and thorax brown mixed with grey-white; abdomen ochreous. Fore wing grey suffused with cupreous brown and slightly striated with black; subbasal line represented by double curved black striæ from costa and oblique white striga from cell defined on each side by black, rather diffused on outer side; antemedial line double, black filled in with whitish, obsolete on costal half and oblique from cell to inner margin; the stigma below the cell oblique V-shaped, silvery white filled in with brownish white, its inner arm sinuous; reniform defined at sides by silvery white and black, constricted at middle and slightly angled inwards above median nervure; postmedial line double, filled in with whitish, oblique from costa to submedian fold, then bent outwards, somewhat dentate towards costa; subterminal line slight, whitish, defined on inner side by fuscous suffusion, slightly incurved at discal fold and angled outwards below veins 4 and 3; a faint whitish line before termen and fine black terminal line; cilia white, mixed with brown at tips. Hind wing pure white; a fine brown terminal line; the underside with the costal area slightly irrorated with brown, a discoidal point and postmedial series of minute streaks on the veins.

Hab. NATAL, Maritzburg, 1 ♂ type. *Exp.* 40 mm.

Allied to *P. lavendula*, Hmps. n.

Plusia clarci, sp. n.

♀. Head, thorax, and abdomen reddish brown mixed with grey-white; tegulæ with slight white line near base and white tips. Fore wing pale grey largely suffused with cupreous brown, especially at middle of medial area and beyond the postmedial line, and sparsely irrorated with dark brown; subbasal line silvery white, straight, from costa to vein 1, a patch of cupreous brown suffusion beyond it; antemedial line represented by an oblique silvery-white striga from costa and obliquely curved line from cell to inner margin defined on each side slightly by dark brown; a small silver U-shaped stigma filled in with grey below the cell towards extremity, with a small rather triangular silver spot obliquely

placed below it; reniform represented by an indistinct brown bar on its inner edge and some slight spots on its outer, an oblique brown shade to it from costa; postmedial line double grey-white filled in with brown, the outer line with silvery outer edge, bent outwards below costa, then oblique, incurved at discal fold, then slightly sinuous; a silvery-white subterminal line from above vein 2 to tornus; a grey-white line just before termen from costa to vein 3, double towards costa; a terminal series of slight dark brown lunules and striæ; cilia brownish at base, grey-white at tips. Hind wing whitish tinged with brown, the terminal area broadly fuscous brown with a cupreous tinge; cilia white, with a brown line near base; the underside white thickly irrorated with brown, oblique brown medial and postmedial rather indistinct lines, and a broad diffused subterminal shade.

Hab. NATAL, Durban (*E. L. Clark*), 2 ♀ type. *Exp.* 38 mm.

Nearest to *P. lavendula*, Hmps.

Plusia microstigma, sp. n.

♀. Head, thorax, and abdomen reddish brown mixed with grey; antennæ with the shaft ringed with white towards base; tarsi ringed with white. Fore wing golden bronze-brown thickly irrorated with grey; traces of an oblique antemedial line; the stigma below the cell small, oblique, V-shaped, its outer arm and a small spot at its apex silvery white; orbicular and reniform very indistinctly defined by grey, the former rather oblique elliptical, the latter constricted at middle; an oblique indistinct rather diffused line from lower angle of cell to inner margin; postmedial line indistinct, oblique, sinuous; traces of a dark subterminal line, excurved below vein 7, angled inwards at discal and submedian folds and outwards below vein 4; a series of minute white striæ just before termen. Hind wing uniform golden bronze-brown, the cilia with a pale line at base and white tips; the underside white thickly irrorated with brown, the terminal area broadly fuscous, with some white irroration near termen.

Hab. GOLD COAST (*Johnston*), 1 ♀ type. *Exp.* 26 mm.

Nearest to *P. livida*, Holl.

Plusia phoece, sp. n.

♂. Head and thorax red-brown with a greyish tinge; tarsi ringed with whitish; abdomen pale ochreous brown, the basal crest and ventral surface grey-brown. Fore wing red-brown with a silvery-grey gloss; subbasal line slight,

whitish, from costa to vein 1; antemedial line obsolete on costal half, slight, oblique, and silvery from cell to inner margin, slightly defined on inner side by dark brown and on outer by a dark shade expanding into a triangular patch below the stigma, which is indistinct silvery U-shaped, with a silvery-white point beyond its lower extremity; reniform very indistinct, dark brown, with slight silvery points on its inner and outer edges, rather quadrate; an indistinct brown spot at middle of costa and oblique shade from lower angle of cell to inner margin; postmedial line slight, silvery, defined on each side by dark brown, excurved below costa, then oblique, excurved at middle and bent outwards below submedian fold; subterminal line silvery grey defined on inner side by dark brown suffusion, angled outwards at vein 7, then slightly incurved and oblique to tornus, some dark suffusion beyond it at middle; a series of slight silvery striæ just before termen. Hind wing brown, with a cupreous gloss; cilia white at tips; the underside whitish suffused with brown, the terminal area broadly fuscous brown.

Hab. NATAL, Durban (*E. L. Clark*), 2 ♂ type. *Exp.* 36 mm.

Closely allied to *P. agramma*, Guen.

NOCTUINÆ.

Exophila multistriata, sp. n.

Head and thorax grey-white tinged with rufous and irrorated with a few black scales; abdomen pale brownish grey. Fore wing pale ochreous brown with extremely numerous pale striæ and slight black irroration, suffused with white except on terminal area; a faint oblique postmedial dark shade from vein 5 to inner margin, with a black spot on its outer edge at submedian fold; cilia somewhat darker brown. Hind wing brownish ochreous with a faint brown postmedial shade and some brown suffusion on termen; the underside ochreous white, the costal area and termen except towards tornus irrorated with large black scales; a black discoidal point.

Hab. NATAL, Durban (*Leigh*), 3 ♂, 5 ♀ type. *Exp.* 40-46 mm.

Closely allied to *E. rectangularis*, Hübn.

LYMANTRIADÆ.

Caviria flavifrons, sp. n.

♀. Head, thorax, and abdomen white; palpi, frons, and

front of pectus orange-yellow ; antennæ with the branches brownish ; fore and mid legs slightly streaked with brown. Fore wing uniform silvery white. Hind wing semihyaline white with a silvery gloss.

Hab. BR. E. AFRICA, Mdimu (*Betton*), 1 ♀ type. *Exp.* 46 mm.

Allied to *C. luteipes*, Wlk.

Redoa rufiterga, sp. n.

♂. Head and thorax red-brown with some white mixed ; palpi black and white ; antennæ with the shaft white, the branches red-brown ; pectus and legs white, the fore and mid legs tinged with ochreous and irrorated with black ; abdomen white, with slight dark segmental rings except at extremity and below, and lateral streaks except at extremity. Fore wing silvery white with a very few black scales on veins of terminal area ; the costal edge yellowish, black towards base and apex ; a small black spot in middle of cell and four points at lower angle ; cilia yellow at tips. Hind wing pure white.

Hab. S. NIGERIA, Lagos (*Boag*), 1 ♂ type. *Exp.* 50 mm.

Pteredoa hololeuca, sp. n.

Fore wing with veins 10, 11 coincident.

♀. Head, thorax, and abdomen pure white ; palpi black above ; antennæ with the branches brownish ; tibiæ and tarsi streaked with black. Fore wing pure white. Hind wing semihyaline white.

Hab. UGANDA, Entebbe (*Minchin*), 1 ♀ type. *Exp.* 34 mm.

Near *P. usebia*, Swinh.

Pteredoa atripalpia, sp. n.

♀. Head, thorax, and abdomen white ; palpi black above ; antennæ brownish ochreous ; tibiæ streaked with black, the tarsi black ; abdomen ventrally tinged with ochreous. Fore wing white tinged with ochreous. Hind wing white.

Hab. ABYSSINIA, Atbara R. (*Gerrard*), 1 ♀, Galla Co. (*Degen*), 1 ♀ type. *Exp.* 38 mm.

Near *P. usebia*, Swinh.

Porthesia erythrosticta, sp. n.

♀. Head and thorax ochreous white ; palpi with some black scales ; antennæ brownish ; abdomen white, the anal

tuft fulvous yellow. Fore wing ochreous white; a post-medial spot formed of black scales above vein 7 and orange-red spot irrorated with black below vein 7, a minute orange-red and black mark below vein 4, and three obliquely placed orange-red and black spots between vein 2 and inner margin. Hind wing white.

Hab. SUDAN, Khartum (*Longstaff*), 1 ♀ type. *Exp.* 36 mm.

Resembles *Euproctis rufopunctata*, Wlk.

Euproctis lepidographa, sp. n.

Hind wing with veins 3, 4 stalked almost to termen.

♀. Head and thorax yellow; abdomen white, the ventral surface tinged with yellow, the anal tuft reddish brown. Fore wing yellow; antemedial line defined, except at costa, by broad bands of raised black scales interrupted at the veins and submedian fold, curved; postmedial line defined on each side by patches of raised black scales in the interspaces, confluent at inner margin with the scales beyond the antemedial line, the line angled outwards at vein 4, then oblique. Hind wing white.

Hab. GOLD COAST, Kumasi (*Whiteside*), 1 ♀ type. *Exp.* 34 mm.

Allied to *E. inconcisa*, Wlk., from India.

Euproctis rufiterga, sp. n.

♂. Head and thorax white suffused with rufous; antennæ with the branches rufous; hind legs and abdomen white. Fore wing white; a slight rufous tinge at base; a yellowish patch below middle of cell; some black scales on discocellulars and a large patch of raised black scales on a yellowish patch between lower angle of cell and inner margin; a subterminal point below vein 8, small spot below 6, and a few scales above tornus. Hind wing white.

Hab. GOLD COAST, Kumasi (*Whiteside*), 1 ♂ type. *Exp.* 26 mm.

Nearest to *E. fasciata*, Wlk.

Euproctis melanopholis, sp. n.

♀. Head, thorax, and abdomen white tinged with ochreous yellow. Fore wing white tinged with ochreous yellow, the inner area irrorated with a few large black scales except towards base; a black discoidal point; subterminal points formed of brown and black scales from costa to below vein 5

and a point below vein 3, with yellow patches before them below costa and at middle. Hind wing white.

On the right-hand side of the type the neuration is much distorted, veins 6, 7 being strongly stalked, with a bar above vein 7 as if to form part of a very long and incomplete areole.

Hab. GOLD COAST, Ashanti, Obuassi (*Bergman*), 1 ♀ type. *Exp.* 36 mm.

Nearest to *E. rubroguttata*, Auriv.

Euproctis fumitincta, sp. n.

♂. Head and thorax reddish ochreous with a few brown hairs; palpi and fore legs in front suffused with fuscous; abdomen brownish ochreous. Fore wing brownish ochreous; the costal edge brown, black towards base; a faint reddish-brown shade at end of cell from below costa to inner margin. Hind wing ochreous suffused with brown. Underside of both wings suffused with fuscous brown.

Hab. GOLD COAST, Kumasi (*Whiteside*), 1 ♂ type. *Exp.* 20 mm.

Nearest to *E. cervina*, Moore, from Ceylon.

Euproctis xanthosoma, sp. n.

♂. Head and thorax dark brown mixed with grey-white; palpi orange; frons with some orange hairs; tarsi dark brown banded with white; abdomen orange-yellow with dorsal series of black spots, the lateral tufts of hair with brown mixed. Fore wing dark brown mixed with grey-white; a subbasal brown point in cell; an antemedial series of points formed of raised brown scales from cell to inner margin; a point in upper part of middle of cell and point below middle of cell; slight bars across end of cell and on discocellulars; a postmedial punctiform line formed of brown scales, oblique from vein 4 to submedian fold, then somewhat bent outwards to inner margin; a punctiform subterminal line slightly excurved at middle; a terminal series of blackish striae. Hind wing uniform dark brown; the underside with a greyish tinge.

Hab. SUDAN, White Nile, Kosti (*Longstaff*), 1 ♂ type. *Exp.* 20 mm.

Very distinct from all other species known to me.

Lacipa heterosticta, sp. n.

♀. Head, thorax, and abdomen white, the patagia with

orange spots, the anal tuft blackish brown. Fore wing white; subbasal orange spots below costa and cell; an antemedial orange spot below costa, a spot rather further from base below the cell, and spot above vein 1; an orange bar across middle of cell; a postmedial series of small orange spots, obliquely curved from below costa towards apex to below end of cell, then erect; the spots below veins 5 and 4 sometimes black and the spot below end of cell sometimes with some black on it. Hind wing white.

Hab. UGANDA, White Nile, Gondokoro (*Reynes-Cole*), 5 ♀ type. *Exp.* 22–28 mm.

Allied to *L. gemmata*, Dist.

Lacipa argyroleuca, sp. n.

♂. Head and thorax white, the latter with orange streaks on dorsum and patagia; palpi and lower part of frons orange; antennæ with the branches rufous; legs tinged with brown, the fore femora black above; abdomen white tinged with yellow towards extremity. Fore wing silvery white; the costal edge brown; an orange subbasal band, oblique to below the cell; an orange antemedial band, interrupted at the veins, excurved in cell; an orange discoidal spot; a maculate orange postmedial band, excurved to vein 4, then incurved, the spots below veins 5 and 4 black; a subterminal series of orange spots. Hind wing white.

Hab. S. NIGERIA, Lagos, Ebute Meta (*Boag*), 1 ♂ type. *Exp.* 24 mm.

Allied to *L. gemmata*, Dist.

Lacipa melanosticta, sp. n.

♂. Head and thorax white; palpi black fringed with yellow in front; antennæ with the branches brown; legs black on inner side, the tarsi banded with black; abdomen yellowish white with blackish segmental rings. Fore wing white, the costa fuscous, narrowly towards base; an antemedial black point in submedian fold, traces of a yellow antemedial line angled outwards in cell; three black points at end of cell in an inverted triangle and black points beyond lower angle of cell below veins 5 and 4, with traces of an oblique yellow postmedial line just beyond them slightly incurved below vein 4; a series of black points before termen. Hind wing pale yellow, with series of slight black points just before termen from apex to vein 2. Underside of fore wing suffused with fuscous, the inner area yellowish; hind wing with black discoidal spot.

Hab. BR. E. AFRICA, Nairobi (*Ford*), 1 ♂ type; UGANDA, Ketoma (*Doggett*), 1 ♂, Mulema (*Doggett*), 1 ♂. *Exp.* 30 mm.

Allied to *L. florida*, Swinh.

Lacipa flavitincta, sp. n.

♀. Head, thorax, and abdomen ochreous yellow; antennæ with the branches brownish. Fore wing white faintly tinged with yellow, more strongly so at base, and very slightly irrorated with fuscous scales; an indistinct curved yellow antemedial line; two black points in end of cell and one beyond the cell; a yellow postmedial line, oblique from costa towards apex to submedian fold, then erect; traces of an oblique brownish subterminal shade; a series of small black spots just before termen. Hind wing white.

Hab. BR. E. AFRICA, Machakos (*Crawshaw*), 1 ♀ type; UGANDA, Mulema (*Doggett*), 1 ♀. *Exp.* 24 mm.

Allied to *L. florida*, Swinh.

Lacipa croceigramma, sp. n.

♂. Head and thorax white, the tegulæ orange; palpi black fringed with yellow in front; antennæ with the branches rufous; fore legs fuscous in front; abdomen yellow with black segmental rings. Fore wing silvery white; sub-basal orange spots below costa and cell; an antemedial black point in submedian fold, followed by an orange band slightly bent inwards below the cell; two black points in end of cell and two or one just beyond the cell; an orange postmedial band, slightly incurved below vein 4; a series of black points just before termen. Hind wing white faintly tinged with yellow; the underside with black discoidal spot and sometimes three small spots just before termen below apex.

Hab. N. NIGERIA, Lokoja (*Dudgeon*), 3 ♂ type. *Exp.* 22 mm.

Allied to *L. sundara*, Swinh.

Lælia evanescens, sp. n.

♂. Head and thorax fulvous yellow; palpi with the second joint black above; legs black in front; abdomen brownish white, the ventral surface fulvous yellow. Fore wing pale yellow, the costa tinged with fulvous towards base; a post-medial series of faint brownish spots, the spots below veins 3 and 2 bent inwards below the cell. Hind wing pale yellow.

Hab. UGANDA, White Nile, Gondokoro (*Reynes-Cole*), 3 ♂ type, Bugoma (*Ladbury*), 1 ♂, Marengi (*Christy*), 1 ♂; BR. E. AFRICA, Kanisa (*Betton*), 2 ♂, Shambe (*Betton*), 1 ♂. *Exp.* 30–40 mm.

Closely allied to *L. setinoides*, Holl., and *adspersa*, H.-S.

Lælia fuscinotata, sp. n.

♂. Head and thorax pale reddish brown mixed with fuscous; legs blackish in front; abdomen pale ochreous, the ventral surface deeper ochreous. Fore wing pale reddish brown thickly irrorated with black; two almost conjoined medial black points in submedian interspace; a small blackish spot just beyond the cell and a spot below vein 3 below end of cell; small subterminal black spots above and below vein 7 and slight marks above and below vein 4; cilia chequered pale reddish brown and fuscous. Hind wing whitish tinged with ochreous brown; traces of subterminal fuscous spots from costa to vein 2, towards which they are bent inwards; the termen slightly irrorated with fuscous; the underside slightly irrorated with black except on inner area, the subterminal spots more distinct.

♀. Much darker brown; fore and hind wings without spots.

Hab. UGANDA, Ruwenzori (*Wollaston*), 1 ♂ type, Marengi (*Christy*), 1 ♀.

Nearest to *L. figlina*, Dist.

Lælia perbrunnea, sp. n.

♀. Head and thorax dark red-brown mixed with black-brown; abdomen red-brown. Fore wing dark red-brown slightly irrorated with black; a blackish discoidal bar. Hind wing pale reddish brown with slight dark irroration.

Hab. BR. E. AFRICA, Njoro (*Cholmley*), 1 ♀ type. *Exp.* 34–40 mm.

Nearest to *L. figlina*, Dist.

Lælia albida, sp. n.

♂. Head and thorax fulvous yellow; abdomen white, the ventral surface tinged with yellow. Fore wing yellowish white, the base of costa slightly tinged with fulvous. Hind wing semihyaline white.

Hab. S. NIGERIA, Sapele (*Sampson*), 1 ♂ type. *Exp.* 34 mm.

Near *L. adspersa*, H.-S., but without spots on fore wing.

Lælia nigripes, sp. n.

♂. Head, thorax, and abdomen fulvous yellow; antennæ with the branches rufous; fore and mid legs black in front. Fore wing semihyaline ochreous white, the base and costal edge tinged with fulvous. Hind wing semihyaline ochreous white. Underside of both wings tinged with fulvous; fore wing with a faint brownish tinge on disk.

Hab. N. NIGERIA, Borgu, Yelwa Lake (*Migeod*), 1 ♂ type. *Exp.* 26 mm.

Near *L. adspersa*, H.-S., but without spots on fore wing.

Lælia seminuda, sp. n.

♂. Head, thorax, and abdomen fulvous brown; tibiæ and tarsi tinged with fuscous. Fore wing fulvous brown, rather thinly scaled and with a faint fuscous tinge on disk; cilia yellowish rufous. Hind wing semihyaline rufous, the cilia yellowish rufous.

♀. Wings much paler semihyaline rufous; anal tuft fuscous brown.

Hab. SUDAN, White Nile, Roseires (*Longstaff*), 1 ♂ type, Gondokoro (*Reynes-Cole*), 1 ♀; BR. E. AFRICA, Sanduk (*Belton*), 1 ♀. *Exp.*, ♂ 32, ♀ 44 mm.

Near *L. testacea*, Wlk., but without the discoidal spot on fore wing.

Lælia atrisquamata, sp. n.

♀. Head, thorax, and abdomen ochreous white; palpi blackish at tips; antennæ with the branches brown; fore legs irrorated with black in front. Fore wing ochreous white irrorated with a few large black scales; small spots formed of aggregations of a few black scales at middle of cell and lower angle. Hind wing white with a faint ochreous tinge.

Hab. GOLD COAST, Ashanti, Obuassi (*Bergman*), 1 ♀ type. *Exp.* 56 mm.

Lælia sericea, sp. n.

♂. Head, thorax, and abdomen ochreous white; palpi orange; antennæ with the branches rufous; tibiæ and tarsi streaked with fuscous; abdomen fulvous yellow below. Fore wing silky whitish tinged with brownish ochreous, the costal area more ochreous, the veins slightly darker, the cilia ochreous white. Hind wing silky whitish tinged with brown,

the cilia ochreous white. Underside of both wings tinged with rufous.

♀. Anal tuft brown; wings semihyaline whitish, the veins of fore wing brownish; the underside with the costa of both wings slightly tinged with rufous.

Hab. UGANDA, White Nile, Gondokoro (*Reynes-Cole*), 2 ♀, Ketoma (*Doggett*), 1 ♀; TRANSVAAL, Warmbad (*Janse*), 1 ♂, 1 ♀ type. *Exp.* 38–40 mm.

Nearest to *L. phlebitis*, Hmps. n.

Lælia discolepia, sp. n.

♀. Head, thorax, and abdomen ochreous yellow; palpi, fore and mid legs irrorated with black; antennæ with the shaft irrorated with black, the branches black. Fore wing ochreous yellow; a patch of irroration formed of large black scales in and beyond end of cell; a few large black scales in cell near base and on inner and terminal areas; the cilia with some black scales at tips towards apex. Hind wing rather paler ochreous yellow; the underside with a few black scales on costal area towards apex.

Hab. SIERRA LEONE (*Dudgeon*), 1 ♀ type. *Exp.* 50 mm.

Lælia rivularis, sp. n.

♀. Head and thorax pale ochreous brown; abdomen brownish white. Fore wing pale ochreous brown; a blackish antemedial point below the cell; an indistinct brownish line from middle of costa, acutely angled outwards to lower angle of cell, where it is met by an indistinct oblique line from costa beyond middle, then bent inwards to origin of vein 2 and oblique to inner margin; an oblique straight brown line from costa towards apex to middle of inner margin, the area before it rather whiter between veins 5 and 2; a brownish subterminal line with more or less complete series of small black spots on it and slightly defined on outer side by ochreous, oblique below vein 4; cilia blackish at tips. Hind wing white tinged with ochreous brown; a subterminal maculate dark line from vein 6 to inner margin; the termen with slight brown irroration. Underside of fore wing with diffused oblique brown patch at upper angle of cell and postmedial line oblique to vein 2, then erect; hind wing with dark discoidal spot and postmedial line excurved below costa.

Ab. 1. Fore wing yellow; hind wing yellowish white. Masevi.

Hab. UGANDA, Masevi (*Christy*), 1 ♀, Ruwenzori (*Wollaston*), 1 ♀ type. *Exp.* 48 mm.

Allied to *L. diapera*, Hmps., and *fracta*, Schaus.

Lælia straminea, sp. n.

♀. Head and thorax ochreous tinged with red-brown; fore tibiæ and tarsi red-brown on inner side; abdomen ochreous white faintly tinged with rufous. Fore wing ochreous tinged with rufous and irrorated with red-brown; antemedial line indistinct, red-brown, slightly excurved below costa, then erect; slight brown points in and beyond lower angle of cell and slight points or minute streaks beyond upper angle above and below vein 7; postmedial line red-brown, very oblique, straight; an oblique subterminal series of small brown spots in the interspaces from below vein 7 to inner margin; cilia red-brown. Hind wing creamy white with a faint red-brown tinge at middle of termen; the underside with the termen slightly irrorated with red-brown from apex to vein 2.

Hab. S. NIGERIA, Old Calabar (*Crompton*), 2 ♀ type. *Exp.* 50 mm.

Allied to *L. rivularis*.

Lælia gigantea, sp. n.

Head, thorax, and abdomen ochreous suffused with red-brown; palpi with the second joint blackish above; fore femora with some dark brown hair above. Fore wing ochreous suffused with red-brown and slightly irrorated with black, the basal half paler except at costa and inner margin with oblique outer edge; traces of a rather diffused dentate brownish antemedial line from below median nervure to inner margin; a small spot formed of aggregated black scales above base of vein 7; two rather diffused very oblique brown postmedial lines and two similar subterminal lines crossed by an oblique brown shade from apex to inner margin just beyond postmedial line. Hind wing ochreous tinged with rufous; a faint brownish discoidal spot; the terminal area slightly irrorated with black; a fine brown terminal line. Underside of fore wing with oblique fuscous-brown discoidal bar; hind wing with discoidal lunule.

Hab. CAMEROONS, ♂ in Coll. Druce; UGANDA, Bugoma (*Ladbury*), 1 ♀ type. *Exp.* 82 mm.

Allied to *L. rivularis*.

Lælia fulvicosta, sp. n.

♂. Head and thorax fulvous brown, the branches of

antennæ brown; abdomen dark greyish brown with the ventral surface fulvous. Fore wing dark red-brown, the costal edge and cilia fulvous. Hind wing semihyaline dark red-brown, the cilia fulvous at tips.

Hab. N. NIGERIA, Lokoja (*Dudgeon*), 1 ♂ type. *Exp.* 22 mm.

GENUS STENAROA, nov.

Type *S. ignepicta*.

Proboscis minute; palpi porrect, extending about the length of head; frons smooth; eyes large, round; antennæ of male bipectinate with long branches to apex and with large tuft of hair from basal joint; tibiæ moderately fringed with hair, the hind tibiæ with terminal pair of spurs only. Fore wing rather long and narrow, the apex rounded, the termen obliquely curved; veins 3 and 5 from near angle of cell; 6 from below upper angle; 7 from angle; 8, 9, 10 stalked; 11 from cell. Hind wing with vein 3 from near angle of cell; 5 from above angle; 6, 7 from upper angle; 8 connected with the cell by a bar near middle.

Stenaroa ignepicta, sp. n.

♂. Head and tegulæ yellow mixed with fiery red; antennæ and thorax deep red-brown; legs yellow, the tibiæ tinged with fiery red; abdomen dark red-brown, the ventral surface yellowish white. Fore wing dark red-brown; antemedial yellow and fiery-red spots in cell and submedian interspace; a large discoidal spot and slight spots on vein 2 and in submedian fold below end of cell; subterminal yellow and fiery-red spots between veins 7, 6 and 5 and 3. Hind wing dark red-brown.

Hab. MADAGASCAR, Betsileo (*Cowan*), 1 ♂ type. *Exp.* 24 mm.

Aroa leonensis, sp. n.

♂. Head and thorax red-brown mixed with greyish; antennæ with the shaft ochreous white, the branches red-brown; palpi and legs whitish tinged with brown; abdomen fuscous ringed with white, the ventral surface white. Fore wing grey tinged with rufous and irrorated with fuscous; subbasal line brown somewhat sinuous and oblique, extending to inner margin; antemedial line whitish, oblique, slightly excurved at median nervure, a band of chocolate-red suffusion beyond it; an indistinct dark medial line, incurved at submedian fold; a faint dark discoidal bar; the postmedial area

with diffused whitish patch on disk; two well-separated dark postmedial lines incurved between vein 3 and submedian fold; terminal area dark chocolate-brown, extending to postmedial line on costal area, its inner edge then excurved; angled inwards between veins 3 and 2 and ending on termen above tornus; a slight dark terminal line; cilia whitish tinged with red-brown and with dark brown line through them. Hind wing greyish brown, the apical area dark brown obliquely from middle of costa to termen at vein 2; cilia whitish tinged with brown and with dark brown line through them; the underside greyish tinged with red-brown and irrorated with dark brown, the apical area darker, a sinuous dark postmedial line.

Hab. SIERRA LEONE (*Bartlett*), 1 ♂ type. *Exp.* 32 mm.
Allied to *A. achrodisca*, Hmps. n.

Crgyia vetusta, sp. n.

♂. Head, thorax, and abdomen whitish tinged with brown; antennæ with the branches brown. Fore wing greyish suffused with red-brown and more or less irrorated with black, the medial area more or less suffused with fuscous except towards costa; a faint blackish subbasal line from costa to submedian fold; a diffused oblique sinuous antemedial line defined by whitish on outer side; a reddish discoidal lunule defined by black and produced at upper extremity; postmedial line diffused, black, dentate and excurved to vein 4, then strongly incurved and defined on inner side by whitish; a curved subterminal series of rather elongate black spots from costa to vein 3, towards costa placed on a whitish patch; cilia rufous mixed with black. Hind wing brown tinged with fuscous, the cilia paler and tinged with rufous. Underside of both wings greyish suffused with fuscous brown, the terminal area of fore wing and inner area of hind wing grey.

Hab. NIGERIA (*Dudgeon*), 1 ♂, Yorubaland, Ogbomoso (*Carter*), 1 ♂ type. *Exp.* 24 mm.

Allied to *O. postica*, Wlk., from India.

Dasychira umbricolora, sp. n.

Abdomen with dorsal crests on basal segments.

♂. Head, thorax, and abdomen umber-brown, the last with the crests blackish; palpi and frons at sides blackish; tarsi blackish with pale rings; ventral surface of abdomen white tinged with red-brown. Fore wing umber-brown with

darker shadings and slightly irrorated with black; antemedial line hardly traceable, oblique below submedian fold; a few black scales on discocellulars and traces of an oblique line from lower angle of cell to inner margin at antemedial line; postmedial line very indistinct, dark, excurved below costa and at middle and incurved at submedian fold, where there is a faint streak of white scales between it and medial line; subterminal line indistinct, blackish, angled inwards below costa, excurved below vein 7 and angled outwards below vein 4, connected below veins 7 and 4 by short streaks with the series of black striæ just before termen; a fine dark terminal line; cilia chequered brown and black. Hind wing reddish brown, the cilia chequered brown and black; the underside grey tinged and irrorated with brown, a blackish discoidal lunule and maculate postmedial and subterminal bands from costa to vein 1.

Hab. S. NIGERIA, Lagos, Ebute Meta (*Boag*), 1 ♂ type, Old Calabar (*Crompton*), 1 ♂. *Exp.* 32-34 mm.

Nearest to *D. striata*, Holl.

Dasychira thermoplaga, sp. n.

♂. Head and thorax pale brownish grey with a diffused red-brown fascia on vertex of head and thorax; palpi at sides and frontal tuft red-brown; tarsi with the tufts of scales blackish; abdomen grey tinged with brown, the crests blackish. Fore wing grey tinged with olive and irrorated with red-brown; a red-brown patch at base of costa extending to just below the cell, where it is produced outwards; rather conical red-brown patches at middle of costa and inner margin, the former including an indistinctly defined narrow discoidal lunule; small subterminal red-brown spots on costa, below veins 5 and 2, and on inner margin; cilia with a series of black-brown spots. Hind wing ochreous white tinged with brown; cilia with a series of small brown spots; the underside ochreous white slightly irrorated with brown.

Hab. SIERRA LEONE (*Dudgeon*), 1 ♂ type. *Exp.* 30 mm. Nearest to *D. whitei*, Druce.

Dasychira endophæa, sp. n.

♀. Head and thorax black-brown mixed with some red-brown and grey; tarsi slightly ringed with whitish; abdomen grey-brown suffused with black-brown. Fore wing black-brown mixed with some red-brown and grey, a diffused ochreous patch suffused with red-brown on antemedial area from costa to median nervure and a large subterminal patch

from costa to just below vein 3 with irregular edges; an indistinct curved black subbasal line from costa to vein 1; traces of a curved antemedial line and of an oblique medial line from lower angle of cell to inner margin; postmedial line indistinct, dentate from costa to vein 4, then incurved; the pale patch with its inner edge angled outwards below costa and at discal fold and its outer edge angled inwards at discal fold; the subterminal line only defined by rather dentate black-brown patches on its inner side, the mark below costa placed on the pale patch, then angled outwards to near termen at veins 7, 6, inwards at discal fold, outwards at vein 4, then incurved; cilia intersected by whitish at the veins. Hind wing greyish brown, the cilia whitish at tips; the underside ochreous suffused with reddish brown, a diffused discoidal lunule, oblique diffused postmedial line, and diffused subterminal line.

Hab. GOLD COAST, Kumasi (*Whiteside*), 1 ♀ type. *Exp.* 56 mm.

Allied to *D. antica*, Wlk., = *albilunulata*, Karsch.

Dasychira magnifica, sp. n.

♂. Head and thorax brown mixed with yellowish, the patagia with some long spatulate yellow and black scales; antennæ with the shaft whitish irrorated with black; tarsi ringed with yellowish; abdomen orange, the crests on three basal segments black, followed by black bands on the terminal segments, the anal tuft blackish tipped with yellow, the ventral surface brown and orange mixed. Fore wing pale red-brown irrorated with black, a band of blackish-brown suffusion beyond the medial line, broad towards costa, the terminal area tinged with greyish; subbasal line blackish, excurved below costa and cell and ending at vein 1; antemedial and medial lines black defined on outer side by greyish, minutely waved; reniform defined by slight black points; postmedial line blackish defined on inner side by a yellowish bar at costa, bent outward below costa, then minutely dentate, angled outwards at vein 4, then incurved; a subterminal series of small somewhat dentate black spots defined on outer side by whitish; a slight irregularly crenulate black line just before termen. Hind wing bright orange, the terminal area broadly black, its inner edge somewhat excurved at middle; cilia ochreous white and fuscous mixed; the underside orange, the costa and the terminal area irrorated with black-brown, a black discoidal spot, a maculate sinuous blackish postmedial band.

Hab. NIGERIA (*Dudgeon*), 1 ♂ type. *Exp.* 64 mm.

Dasychira phoca, sp. n.

Abdomen without dorsal crests.

♂. Head and thorax black-brown; tarsi mixed with whitish; abdomen brownish ochreous, the ventral surface darker. Fore wing ochreous brown with a cupreous gloss; subbasal line blackish, excurved below costa and cell, and ending at vein 1; antemedial line indistinct, blackish, curved, waved; the discocellulars defined by blackish striæ; a waved blackish line from lower angle of cell to inner margin; postmedial line indistinct, dark, minutely dentate towards costa, incurved and slightly sinuous below vein 4; an indistinct waved blackish subterminal line, excurved at veins 6 and 4; a series of curved blackish striæ just before termen. Hind wing white tinged with brownish ochreous.

♀. Abdomen grey tinged with ochreous brown; fore wing almost entirely suffused with black-brown; hind wing whitish tinged with fuscous brown; the underside white thickly irrorated with brown.

Hab. UGANDA, Mulema (*Doggett*), 1 ♂ type. *Exp.* 36–38 mm.

Dasychira pheosia, sp. n.

♂. Head and thorax grey mixed with white and red-brown; antennæ with the branches rufous; tips of patagia and metathorax red-brown; fore tibiæ and tarsi red-brown streaked with blackish; abdomen ochreous tinged with rufous, a dorsal black streak on basal segments, some dark brown suffusion at middle. Fore wing ochreous tinged with rufous; an interrupted red-brown streak below basal half of costa and two streaks in cell; a curved dark red-brown fascia from base of costa along vein 1 to beyond middle, then upwards to just before termen at vein 7; a slight double streak with deep red-brown above it above medial part of inner margin, bent upwards to above vein 1 at extremity; the tornal area greyish; reniform faintly defined by some dark scales; slight red-brown streaks below costa towards apex; a fine blackish terminal line; cilia greyish with some blackish at tips. Hind wing yellowish white; the cilia with a dark line through them; the underside with faint brown spot at upper angle of cell.

♀. Fore wing suffused with red-brown and irrorated with blackish, the interspaces beyond the cell with obscure streaks, the reniform more distinct, with pale centre; hind wing suffused with brown; the underside suffused and irrorated

with brown, a dark discoidal spot and diffused curved post-medial and subterminal lines.

Hab. GOLD COAST, Kumasi (*Whiteside*), 1 ♂ type; S. NIGERIA, Lagos (*Strachan*), 1 ♀. *Exp.*, ♂ 42, ♀ 44 mm.

Near *D. lignea*, Butl., from Madagascar.

Dasychira griseinubes, sp. n.

♀. Head, thorax, and abdomen rufous mixed with ochreous, the ventral surface of abdomen yellower. Fore wing ochreous suffused with rufous and irrorated with red-brown; a curved red-brown antemedial line slightly defined on inner side by ochreous and with a diffused leaden-grey band on its outer side from costa to above vein 1, obscurely forked towards costa; reniform very indistinctly defined by red-brown, its outer edge with long teeth on veins 6 and 4 to postmedial line, which is red-brown, very strongly dentate, the tooth on vein 4 extending to near termen, double below vein 3; the terminal area suffused with red-brown and with a faint sinuous dark line before termen; cilia black-brown at tips. Hind wing ochreous suffused with rufous; the underside with diffused brown postmedial line, excurved to vein 5, then incurved and ending at submedian fold, a rather maculate brown subterminal line from costa to vein 2, obsolescent below vein 5.

Hab. S. NIGERIA, Sapele (*Sampson*), 1 ♀ type. *Exp.* 42 mm.

Dasychira poliotis, sp. n.

♀. Head and thorax white mixed with pale brown; antennæ with the branches rufous; fore tibiæ irrorated with black, the tarsi blackish ringed with white; abdomen white, dorsally suffused with pale reddish brown and with some yellow at sides. Fore wing white tinged and thickly irrorated with brown, the veins brown; traces of a waved antemedial line; a triangular discoidal mark defined by brown; a brown line from origin of vein 2 to inner margin, angled outwards below vein 2, then slightly sinuous and traces of an obliquely curved line from costa beyond the cell to lower angle of cell; postmedial line rather diffused, brown, obliquely curved and somewhat dentate; traces of a maculate brownish subterminal line and a series of small blackish spots just before termen; a fine dark terminal line. Hind wing white.

Hab. TRANSVAAL, White R. (*Cooke*), 1 ♀ type. *Exp.* 54 mm.

Allied to *D. horsfieldi*, Moore.

Dasychira bryophilina, sp. n.

♀. Head and thorax yellowish white with a black bar on prothorax and paired spots on meso- and metathorax; palpi and lower part of frons black; antennæ with short black branches; femora black above, the tibiæ and tarsi banded with black; abdomen white suffused with black. Fore wing yellowish white; a curved black subbasal line from costa to below vein 1 near base, emitting a short streak below costa; the antemedial area with slight black striga above inner margin; antemedial line strong, black, angled outwards at median nervure and inwards at submedian fold; a black patch at middle of inner margin conjoining the antemedial, medial, and postmedial lines; a small round black spot at middle of cell; reniform defined by black and with some black in centre; medial line oblique from costa to reniform and incurved from cell to the black patch, some black suffusion beyond it below costa and cell; postmedial line black, strongly bent outwards below costa, slightly angled inwards at discal fold, below vein 4 incurved to near the medial line and produced to very short streaks at the veins; a black spot on costa before apex, very slight subterminal streaks on the veins, and an oblique black bar at tornus; a black terminal line; cilia intersected by black streaks. Hind wing white tinged with fuscous, the terminal area suffused with fuscous; a slight discoidal lunule and terminal series of points and striæ; cilia pure white; the underside with the costal area suffused and irrorated with blackish, the discoidal lunule stronger.

Hab. CAPE COLONY, Deelfontein (*Sloggett*), 1 ♀ type.
Exp. 32 mm.

Allied to *D. octophora*, Hmps.

Dasychira pyrosoma, sp. n.

♂. Head and thorax white, the tegulæ, upper part of patagia, throat, fore femora, and the tibiæ tinged with yellow; palpi with the second joint black above, tinged with yellow in front; antennæ with the branches rufous; abdomen white, the basal segment with slight dorsal tuft of orange-red hair, the second to sixth segments with broad fiery scarlet subdorsal bands, leaving slight white segmental lines and a dorsal streak. Fore wing silvery white; traces of a bisinuate yellowish antemedial line and of a discoidal lunule defined by yellowish; the terminal area with four faint curved yellowish lines; cilia faintly yellowish at base. Hind wing silvery white.

Hab. TRANSVAAL, Johannesburg (Cooke), 1 ♂ type. *Exp.* 52 mm.

Allied to *D. confinis*, Dist.

Dasychira leucogramma, sp. n.

Hind wing with veins 3, 4 strongly stalked.

♂. Head and thorax white mixed with red-brown; abdomen white. Fore wing white suffused with red-brown; a white streak in submedian fold; an oblique white line from costa before middle to the submedian streak near base, another line from the same point on costa to the submedian streak beyond middle, where it is joined by an oblique white line from costa towards apex. Hind wing pure white.

Hab. SIERRA LEONE, Port Lokko (Penny), 1 ♂ type. *Exp.* 24 mm.

Aclonophlebia triangulifera, sp. n.

♀. Head, thorax, and abdomen ochreous tinged with rufous; antennæ black-brown except at base; abdomen with small dorsal black-brown spots on second, fourth, and fifth segments and lateral spots on third and fourth segments. Fore wing ochreous yellow tinged with red-brown and irrorated with dark brown on terminal half; two slight subbasal black points in submedian interspace; a medial triangular chocolate-brown patch from below origin of vein 2 to vein 1, edged by black defined by pale yellow, and with oblique black striæ from its angles to inner margin; an ill-defined conical yellow postmedial patch from costa to discal fold and a spot between veins 4 and 3, before the subterminal series of faint brownish spots incurved at discal fold; cilia with some dark brown at tips. Hind wing creamy white, the tornal area suffused with brownish.

Hab. BR. E. AFRICA, Taveta (Rogers), 1 ♀ type. *Exp.* 38 mm.

Allied to *A. flavinotata*, Butl.

Lomadonta ochriaria, sp. n.

♀. Head, thorax, and abdomen pale ochreous yellow; palpi, pectus, legs, and ventral surface of abdomen orange-yellow; antennæ with the branches rufous; anal tuft dark brown mixed with greyish. Fore wing pale ochreous yellow irrorated with dark brown; traces of a diffused oblique shade of thicker irroration from middle of cell to inner margin, a faint patch of thicker irroration in end of cell, and traces

of curved postmedial and subterminal shades. Hind wing white, the inner area and termen with an ochreous tinge.

Hab. GOLD COAST, Kumasi (*Whiteside*), 1 ♀ type. *Exp.* 40 mm.

Hypsidæ.

Digama strabonis, sp. n.

♀. Head and thorax white, the frons below and above, the tegulæ at middle and sides, the patagia and prothorax with paired black spots; palpi with black spots at extremities of first, second, and third joints; pectus and legs yellowish white, the fore coxæ and pectus at sides with black spots; abdomen pale yellow, with dorsal, lateral, and sub-lateral series of black spots. Fore wing grey-brown; an irregular white patch at base edged with blackish and almost conjoined to a large very irregular white antemedial patch edged with blackish and with black spots on it below the cell and above inner margin, the upper edge of the patch with two projections to below costa, and the outer edge with two projections in submedian interspace, a small white spot beyond it above inner margin; an elliptical white spot edged with blackish in end of cell conjoined to a spot on costa and with round black spot on it near its inner lower edge; a broad extremely irregular white postmedial band edged with blackish extending into the end of cell and with small black spots on it at the angles of cell and small brown spots beyond the cell above vein 6 and on vein 4, the upper spot elongate, the band expanding on inner side at middle and at vein 1 and on outer with rounded projections below vein 7, at middle and submedian interspace; a series of darker brown spots on termen. Hind wing pale yellow, with a blackish-brown terminal band from apex to vein 3, where it narrows to a point, its inner edge sinuous; cilia white, brown at apex. Underside of fore wing with brown fascia along median nervure from before middle, expanding into a triangular patch extending to below costa beyond the cell, a small black spot on costa before middle, a round spot at middle of cell, and a diffused blackish patch at upper angle of cell.

Hab. TRANSVAAL (*Pead*), 1 ♀ type. *Exp.* 42 mm.

Allied to *D. sinuosa*, Hampsn.

Digama nepheloptera, sp. n.

♂. Head and thorax white tinged with brown; tegulæ with black spots; patagia with black spots on shoulders and

two above; meso- and metathorax with black spots; palpi with the third joint black; antennæ blackish; coxæ with black spots; legs tinged with fuscous; abdomen yellow, with dorsal and lateral series of black spots, the ventral surface brownish white. Fore wing brownish white, the costal area and cell white to beyond middle, the markings defined by white; a small black spot at base and three subbasal spots; antemedial spots below costa and cell and above vein 1, obliquely placed; two obliquely placed spots in middle of cell; a very irregular medial brown band, expanding and blackish at costa, its inner edge angled inwards at submedian fold and vein 1, its outer angled outwards in and below cell, below submedian fold, and at inner margin; a triangular black-brown postmedial spot on costa and small black spots above veins 6, 4, 3; small irregular subterminal brownish spots above and below veins 5 and 2, the terminal area rather darker than the ground-colour and narrowing to a point at apex. Hind wing white faintly tinged with ochreous.

Hab. TRANSVAAL, White R. (Cooke), 1 ♂ type. *Exp.* 36 mm.

Nearest to *D. pilosoma*, Feld.

Digama septempuncta, sp. n.

♀. Head and thorax white, the frons and vertex of thorax tinged with yellow, the frons above and below, the tegulæ, shoulder, patagia, and prothorax with paired black points; palpi with black spots at extremities of first, second, and third joints; fore coxæ and pectus at sides with black spots; fore tibiæ and tarsi banded with fuscous; abdomen yellow, with lateral and sublateral series of black spots, the ventral surface whitish. Fore wing creamy white; a black point at base of costa, a subbasal point in cell, antemedial points below costa and cell, a point in middle of cell and two on discocellulars. Hind wing yellow. Underside of fore wing yellow, the costal edge whitish, a black point in middle of cell and two slight discoidal points.

Hab. RODRIGUEZ (Manders), 1 ♀ type. *Exp.* 36 mm.

Nearest to *D. insulana*, Feld.

Caryatis stenoperas, sp. n.

♂. Head and tegulæ scarlet, the frons, vertex of head, and tegulæ with black spots; palpi black, scarlet at base and with white ring at extremity of second joint; antennæ black, the shaft white above; thorax black, the tegulæ edged with grey and scarlet, the vertex of thorax with three grey

and scarlet streaks meeting behind; pectus scarlet, with black-brown spots at sides; legs black-brown streaked with white; abdomen scarlet, with dorsal, lateral, and sublateral series of black spots. Fore wing grey-brown, the veins and discal fold on basal half and the submedian fold and vein 1 to termen finely streaked with white; an oblique white band from just below costa beyond middle to termen just above tornus, somewhat expanding at middle; a slight scarlet mark at base. Hind wing orange-scarlet, with narrow black-brown band at apex.

Hab. UGANDA, Entebbe (*Minchin*), 1 ♀ type. *Exp.* 54 mm.

Allied to *C. phileta*, Drury.

Geodena sphingifacies, sp. n.

♂. Head black, the frons, two slight streaks on back of head, and the tegulae orange; palpi white and orange at base; thorax white tinged with brown; abdomen white with some brown at extremity, the ventral surface with the basal segments tinged with fulvous, the terminal segments with fuscous bands. Fore wing semihyaline white, the costa fuscous black, the terminal area broadly fuscous black, the outer edge of the white area running obliquely from below costa just beyond middle to below vein 3, where it is acutely angled, again angled at vein 2, then incurved and oblique to inner margin towards tornus; a small white spot above vein 6. Hind wing semihyaline white; a black point on upper discocellular; a fuscous black terminal band with very irregular inner edge, incurved below costa, angled outwards at vein 6, excurved to termen at vein 3, and angled inwards at vein 2 and submedian fold.

Hab. UGANDA, Kimmi I. (*Minchin*), 2 ♂ type. *Exp.* 42 mm.

Allied to *G. inferna*, Swinh.

Geodena monostigma, sp. n.

♂. Head, thorax, and abdomen white tinged with brown; palpi and branches of antennae blackish. Fore wing semihyaline brownish white; a black discoidal spot and traces of a postmedial spot in submedian fold. Hind wing semihyaline brownish white, with a small black discoidal spot; both wings with fine dark terminal line.

Hab. UGANDA (*Doggett*), 1 ♂ type. *Exp.* 40 mm.

Allied to *G. semihyalina*, Swinh., and *disticta*, B.-Baker.

Soloe fumipennis, sp. n.

Head, thorax, and abdomen fulvous orange; palpi with the third joint black; antennæ brown except towards base; femora at extremities and the tibiæ and tarsi fuscous. Fore wing semihyaline brown, the costal edge fuscous; a small fulvous-orange mark at base; a round black spot in cell before middle and another on discocellulars. Hind wing semihyaline brown; a round black discoidal spot.

Hab. GAZALAND, Chirinda Forest (*Marshall*), 2 ♂, 4 ♀ type. *Exp.* 48–50 mm.

Allied to *S. trigutta*, Wlk.

Sphingidæ.

*PERGESINÆ.**Hippotion pentagramma*, sp. n.

Head, thorax, and abdomen grey-brown; palpi rufous at sides except at tips; pectus and ventral surface of abdomen white, the femora and tibiæ rufous streaked with white. Fore wing pale grey-brown; the costal edge rufous; traces of two rufous antemedial lines, acutely angled outwards on median nervure, then very oblique and not reaching inner margin; a diffused rather bifid rufous patch beyond the cell with some fuscous on it above vein 4; five very obliquely curved postmedial brown lines, bent inwards to costa, the outermost line rather stronger, met by an oblique streak from apex and with blackish points on it at the veins; the terminal area slightly irrorated with black. Hind wing fuscous brown; the subterminal area reddish from vein 5 to submedian fold with slight dark spots on the veins; the termen grey irrorated with black except at apex; cilia pale; the underside pale reddish striated with fuscous, the inner area whitish, a slightly waved fuscous subterminal line from costa to submedian fold, double towards costa.

Hab. ABYSSINIA, Daladu (*Drake-Brockman*), 1 ♂, 1 ♀; SOMALILAND (*Drake-Brockman*), 1 ♂ type. *Exp.* 46–58 mm.

Nearest to *H. chloris*, Roths.

Notodontidæ.

Spatalia baccata, sp. n.

♀. Head and thorax grey-brown mixed with deep rufous; abdomen grey-brown. Fore wing grey-brown, the area between subcostal nervure and vein 1 to postmedial line

ochreous yellow thickly irrorated with deep blood-red; an oblique antemedial maculate silvery band between subcostal nervure and vein 1, defined on outer side by deep blood-red and traversed by a slight blood-red striated line; a grey-brown discoidal bar; an oblique postmedial series of round silvery spots from below costa to vein 1, the uppermost spot traversed by a blood-red striga, the red and yellow extending to just beyond the uppermost spot; a fine crenulate red-brown subterminal line slightly defined on inner side by grey; a fine blackish terminal line. Hind wing grey-brown, the cilia pale at tips; the underside white faintly tinged with brown, especially on terminal area.

Hab. N. NIGERIA, Ilorin (*Lugard*), 1 ♀ type. *Exp.* 32 mm.

Allied to *S. argyrophora*, Hmps.

Cerura marshalli, sp. n.

♂. Head and thorax white, the tegulae tinged with ochreous; palpi and frons below and at sides black; antennae with the branches black and the shaft suffused with black at middle; a black point on vertex of head; a black band behind tegulae, the dorsum of thorax black and two black spots on metathorax, the tips of the black scales with a silvery gloss; tibiae spotted with black, the tarsi black, with some white hairs; abdomen black, with a few white hairs, the hair at base white, the anal tuft with white hair mixed, the ventral surface white. Fore wing silvery white; a subbasal black point below costa; the antemedial area with some black scales at costa, on vein 1, and above inner margin; an oblique antemedial black band with irregularly sinuous edges; a medial black point on costa, followed by a short bar, then a point; a rather elongate postmedial black mark on costa, followed by two points, and a triangular mark on inner margin just before tornus; cilia with a series of black spots. Hind wing white, with a series of small black spots on cilia and a small triangular spot on termen at vein 1; the underside with black discoidal spot.

♀. Abdomen dorsally irrorated with white; fore wing with the medial bar on costa more prominent, the postmedial patch more elongate, slight black marks above and below vein 5 and some black scales above the triangular patch.

Hab. MASHONALAND, Salisbury (*Marshall*), 3 ♂, 6 ♀ type. *Exp.*, ♂ 50, ♀ 58-70 mm.

Larva. Black-brown banded with white, the paired anal appendages long and thorny.

Allied to *C. spiritalis*, Dist.

Cerura leonensis, sp. n.

♀. Head and tegulæ white tinged with ochreous; palpi and sides of frons black; antennæ with the branches black, the shaft irrorated with black at middle; a black point on vertex of head; thorax white, with blue-black band behind tegulæ, the dorsum blue-black, followed by a bar on mesothorax and paired bars on metathorax, the patagia with paired blue-black spots; pectus black in front, the tibiæ with black spots and the tarsi black except at base; abdomen white sparsely irrorated with blue-black, more thickly at extremity, the second segment with dorsal black band, the ventral surface white, with the extremity black slightly irrorated with white. Fore wing silvery white; subbasal line represented by a small black spot on costa, then by an irregularly sinuous line of black scales; an antemedial oblique band formed of black spots irrorated with white, the spots above and below vein 1 confluent; three rather wedge-shaped black spots on medial part of costa, the medial line arising from the middle spot, forming a slight curved striga on discocellulars, represented by a few scales on vein 2 and a slight line from submedian fold bent outwards to inner margin; an oblique black bar beyond the discocellulars; an elongate postmedial black mark on costa; the double postmedial line arising beyond upper angle of cell, a slight line of scales on its inner side connected with the discoidal striga at lower angle of cell and enclosing the bar beyond the cell except above, the outer postmedial line almost obsolete beyond the cell, then the double line angled outwards at veins 3, 2, and 1 and inwards below vein 2; a small black spot on costa before the black subterminal line, which is incurved below veins 6 and 3, angled outwards at veins 3, 2, and inwards below vein 2; a series of black spots on termen and cilia, two spots forming a pair above tornus. Hind wing white; a black spot above middle of inner margin; the veins towards termen slightly streaked with black and the apex irrorated with black; cilia almost wholly black towards apex, then with series of black spots, the spot at vein 1 extending onto termen. Underside white, both wings with black discoidal spot and broad terminal band, narrowing to termen above tornus of hind wing; fore wing with black spots on

costa and white postmedial band defined on inner side by black suffusion except on inner area.

Hab. SIERRA LEONE, 1 ♀ type. *Exp.* 66 mm.

Allied to *C. liturata*, Wlk., from India.

Cerura argentescens, sp. n.

♂. Head and thorax white mixed with black; pectus and lower part of frons black; antennæ with the branches black; pectus black-brown; legs white mixed with black-brown, the tarsi ringed with brown; abdomen with the basal half white, with some black hair at base, the terminal half black-brown, the ventral surface white. Fore wing silvery white slightly irrorated with blackish; subbasal line double, waved, angled inwards in submedian fold, the area between it and antemedial line suffused with black from costa to median nervure and thickly irrorated with black on inner area; antemedial line double, angled outwards in submedian fold and bent outwards to inner margin; medial line indistinct, double, waved, enclosing a tuft of black scales on discocellulars; postmedial line double, bent outwards below costa, incurved at discal and submedian folds, some small black spots beyond it on costa, and some black suffusion from costa to vein 4 and from vein 2 to tornus; a terminal series of strong black striæ. Hind wing silvery white, the veins tinged with fuscous; a rather diffused oblique fuscous postmedial line; a terminal series of small black spots. Underside of fore wing fuscous brown; hind wing with medial fuscous bar from costa, the postmedial line distinct and excurved below costa.

Hab. NATAL (*Iidgedon*), 1 ♂ type. *Exp.* 40 mm.

Allied to *C. liturata*, Wlk.

Cerura esmeralda, sp. n.

♂. Head, thorax, and abdomen pale blue-green, the hair on vertex of head whitish; palpi and sides of frons black; a black spot on vertex of head; branches of antennæ black-brown; a black band behind tegulæ, the patagia with black annuli, the meso- and metathorax with paired black spots; tibiæ and tarsi banded with black. Fore wing pale blue-green; a short black streak below base of cell; a subbasal black striga from costa; antemedial line black defined on inner side by silvery white, forming an annulus at costa and produced to a slight black streak below the annulus, ex-

curved and rather bidentate in submedian interspace, angled inwards on vein 1; a black-defined triangle on middle of costa and black line defined on outer side by silvery white from lower angle of cell to inner margin, oblique and sinuous to vein 1, then bent inwards, the silvery white running obliquely from lower angle of cell to the costa beyond the antemedial black annulus; two black bars with white between them, followed by a point on postmedial part of costa; postmedial line black defined on inner side by silvery white, arising at vein 8, angled inwards at discal fold, outwards at veins 4, 3, 2, inwards just below vein 2, where there is a black fascia from just beyond it to tips of cilia just above tornus, then excurved at vein 1; an irregular wedge-shaped subterminal mark from costa to vein 7 enclosing a green point on costa; the cilia intersected by black streaks in the interspaces, those above and below vein 6 conjoined into a hoop emitting a minute black streak on vein 6. Hind wing glossy greenish white, with an oblique subterminal black striga in submedian interspace and small conical spot on termen; the underside with black discoidal spot and small postmedial spot on costa.

♀. Pale sap-green; abdomen dorsally banded with black except at base and extremity; fore wing with the medial area, except towards costa and the area just beyond the postmedial line, clouded with deeper sap-green.

Hab. MASHONALAND, Salisbury (*Marshall, Dobbie*), 2 ♀; TRANSVAAL, Leydenburg Distr. (*Ayres*), 1 ♂, 1 ♀, Pretoria (*Crawshay*), 1 ♂ type, Johannesburg (*Cooke*), 1 ♀. *Exp.*, ♂ 40, ♀ 48-52 mm.

Chadisra uncifera, sp. n.

Antennæ of male bipectinate with long branches, the apex ciliated.

♂. Head, thorax, and abdomen ochreous suffused with rufous; palpi blackish above. Fore wing ochreous suffused with red-brown and slightly irrorated with black; slight sub-basal black spots below costa and cell; double antemedial black striæ from costa, a slight streak below costa, a hook-shaped mark defined by black from discal to submedian folds, with a very oblique black streak from its lower edge to inner margin near base; postmedial line very indistinct, double, produced to long acute teeth on the veins, oblique below vein 4, slight dark streaks beyond it above veins 6, 5, 4; subterminal line represented by short blackish streaks on

faint pale streaks in the interspaces from costa to vein 4, a V-shaped mark below vein 4, and an obliquely curved band defined on outer side by yellowish from vein 3 to inner margin; a terminal series of blackish striæ; cilia chequered rufous and blackish. Hind wing ochreous suffused with rufous; a black bar above tornus with slight striga above it; cilia chequered rufous and black.

Hab. NATAL, 1 ♂ type. *Exp.* 40 mm.

Chadisra nubifera, sp. n.

Antennæ of male bipectinate with long branches, of female with short branches.

♂. Head and thorax grey mixed with brown and some black; palpi black above; tarsi brown ringed with whitish; abdomen pale fulvous yellow slightly irrorated with brown and with whitish segmental lines towards extremity, the ventral surface white irrorated with brown. Fore wing grey-white thickly irrorated with brown, the basal area whiter, the veins with slight blackish streaks; a slight black streak below base of cell and subbasal points below costa and above and below vein 1; antemedial line indistinctly double, filled in with white, excurved and waved, some fuscous suffusion before it and slight oblique black streaks below vein 1 and above inner margin; traces of a diffused medial brown shade; postmedial line defined on outer side by whitish, then by fuscous, minutely dentate and produced to black and white streaks on the veins, excurved to vein 4, then incurved, some blackish striæ beyond it from costa; subterminal line represented by a series of small blackish spots on somewhat dentate whitish patches and a bar from below vein 2 to inner margin, somewhat incurved below vein 4; a terminal series of black striæ. Hind wing pure white, with subterminal black bar above tornus with a black mark before it on inner margin; a terminal series of black striæ; cilia blackish towards tornus; the underside with the costal area slightly irrorated with brown.

♀. Fore wing with subbasal band of dark suffusion and more dark suffusion before the antemedial line; hind wing with the terminal area slightly tinged with brown.

Hab. BR. E. AFRICA, Taveta (*Rogers*), 1 ♂, 1 ♀ type. *Exp.*, ♂ 32, ♀ 34 mm.

Chadisra rosinaria, sp. n.

Antennæ of male bipectinate with long branches, short towards apex.

♂. Head and thorax rufous mixed with grey and some black; palpi with the second joint black above; tegulæ with white band before dorsal part of tips, which are black; patagia grey at shoulders, rufous above; a white band before metathorax, which is mostly black; fore tibiæ with black ring; abdomen ochreous white tinged with brown, a hairy blackish crest at base, the ventral surface white. Fore wing rufous mixed with some grey-white, the area before subterminal line whiter; subbasal line blackish, incurved in cell and ending at vein 1, the area before it whitish; antemedial line black, indistinctly double, especially on inner half, somewhat dentate towards costa, then straight and erect; postmedial line blackish, faintly defined on outer side by white and on both sides at costa and inner margin, slightly angled outwards below costa and at vein 4, then incurved and slightly angled outwards at vein 1, some whitish points with fuscous striæ between them beyond it on costa; subterminal line formed of faint whitish spots defined by some black scales and a more distinct black spot below vein 3; cilia intersected by fuscous at the veins. Hind wing silky white, the hair on inner area tinged with ochreous; a rufous patch on termen and cilia in submedian interspace defined on inner side by a double blackish bar filled in with white; the underside with the costa tinged with yellow and with slight rufous marks beyond middle and towards apex.

Hab. NATAL, Durban (*Leigh*), 1 ♂ type. *Exp.* 42 mm.

Chadisra ochribasis, sp. n.

♂. Head and thorax rufous mixed with ochreous, the patagia mostly white; legs whitish streaked with brown, the tarsi ringed with brown; abdomen white, with some reddish brown and ochreous at base and extremity. Fore wing with the basal half ochreous mixed with rufous, bounded by an oblique sinuous rufous line, the subbasal line represented by a small dentate brown mark below costa, the antemedial by a small spot on costa; an elongate brown mark below the cell near base; the rest of wing brown suffused and irrorated with grey and with a broad band of white suffusion beyond the medial line; postmedial line represented by a brown striga from costa, then by points on the veins, bent outwards below costa, then oblique, the costa beyond it with

white points with dark streaks between them ; faint traces of a whitish subterminal line with slight brown streaks before it above veins 6, 5, 4, and a pair of small dentate marks in submedian interspace ; the veins of terminal area with dark streaks and white points at their extremities. Hind wing pure white, the veins of terminal half streaked with brown, the terminal area suffused with red-brown, narrowing to tornus ; cilia with series of white points and white tips, wholly white towards tornus. Underside of fore wing with the basal half white, the terminal half pale red-brown with white points on costa ; hind wing white, the veins streaked with red-brown towards termen, which is suffused with red-brown from apex to vein 2.

Hab. BR. E. AFRICA, Laitokitok (*Rogers*), 3 ♂ type. *Exp.* 62 mm.

Chadisra semiflava, sp. n.

Antennæ of male bipectinate with moderate branches, the apical third ciliated.

♂. Head and thorax pale yellow with a few rufous scales, the metathorax with rufous spot ; palpi brown above ; antennæ rufous ; abdomen rufous, the ventral surface yellowish white. Fore wing with the basal half pale yellow faintly clouded in parts with rufous, the terminal half rufous mixed with greyish ; two slight black points below costa near base and traces of a black streak below the cell, with traces of another minute black streak below it at middle ; a minute antemedial black streak below costa and another below middle of costa and two in cell ; medial line black defined on inner side by rufous, slightly angled outwards below costa, oblique and sinuous to below angle of cell, then inwardly oblique and excurved at vein 1 ; postmedial line indistinctly double, oblique to vein 6, then dentate and rather inwardly oblique, joined at vein 3 by another slightly waved brown line from costa well before it, some rufous and greyish marks beyond it on costa, a minute wedge-shaped black mark below costa and slight rufous streak on vein 8 ; subterminal line greyish defined on outer side by brown, waved ; a fine dark terminal line. Hind wing silky white ; a brown patch on termen and cilia from vein 2 to below vein 1, with a whitish striga on it angled outwards at vein 1 ; the underside with the costal area yellowish, with minute postmedial rufous points on and below costa.

Hab. NATAL, Durban (*Leigh*), 1 ♂ type. *Exp.* 46 mm.

Allied to *C. curvilinea*, Swinh.

Chadisra persimilis, sp. n.

Antennæ of male minutely serrate and fasciculate.

♂. Head and thorax pale yellow slightly mixed with brown, especially on tegulæ; palpi black except at base; antennæ brown with a blackish patch between them; fore femora and tibiæ streaked with black on inner side, the tibiæ with oblique streaks, the tarsi ringed with brown; abdomen pale yellow dorsally suffused with brown, the basal crest with some black mixed. Fore wing with the basal half pale yellow slightly irrorated and in parts clouded with brown, extending on costa to middle and on inner area to subterminal line, the rest of wing brown broadly suffused with grey-white on costal area; traces of a black streak below base of cell, with faint annulate mark of brown and black scales below it at middle; some slight brown suffusion below costa near base and before middle; minute antemedial black streaks below costa and in cell; medial line blackish defined on inner side by brown suffusion, oblique and sinuous from costa to below angle of cell, then inwardly oblique and angled outwards at vein 1; postmedial line black, slightly defined on outer side by whitish towards costa, dentate, slightly angled outwards at vein 6 and oblique below vein 3, where it is joined by a faint waved line from well before it; subterminal line very indistinct, whitish defined on inner side by brown, waved, incurved at discal fold and in submedian fold to near postmedial line; a series of slight dark striæ just before termen; cilia chequered with whitish at tips. Hind wing white, the hair on inner area tinged with ochreous; a brown patch on termen and cilia from vein 2 to below vein 1, with a white and blackish bar on its inner edge; cilia pale rufous, white at tips; the underside with the costal area tinged with yellow and slightly irrorated with rufous.

Hab. NATAL, Durban (*Leigh*), 1 ♂ type. *Exp.* 34 mm.
Almost identical in appearance with *C. semiflava*.

Somera poliostrata, sp. n.

Palpi with the third joint long and porrect.

♂. Head and thorax dark reddish brown mixed with some grey; tarsi with pale rings; abdomen red-brown, the ventral surface whitish. Fore wing red-brown mixed with grey, glossy, the veins darker brown; traces of a waved dark antemedial line; postmedial line indistinct, dark, bent outwards below costa, then oblique and somewhat dentate; a

faint lunulate whitish subterminal line; a fine dark terminal line. Hind wing silky white tinged with red-brown; a fine dark terminal line; cilia brown at base, whitish at tips.

Hab. CAPE COLONY, Namaqualand, O'okiep, 1 ♂ type.
Exp. 46 mm.

[To be continued.]

BIBLIOGRAPHICAL NOTICE.

Yorkshire Type Ammonites. Edited by S. S. BUCKMAN, F.G.S.; with Photographs by J. W. TUTCHER. Part I. pp. i-xii, i-ii; 12 Plates and Descriptions Nos. 1-8. London: William Wesley & Son, 1909.

ALL who concern themselves with the evidences of Evolution are of necessity interested in the Ammonites, and, as a consequence, treatises on this group are always welcome.

Scattered up and down the country, either in Museums or in private Collections, valuable material bearing on this study has accumulated, yet, owing to their relative inaccessibility, much of their usefulness is lost. Mr. S. S. Buckman, who has devoted laborious days to the study of this group, realizing this, is endeavouring to effect a remedy by describing in minute detail at least one of these collections, whereby, doubtless, much new and valuable evidence bearing on the general problem of the evolution of the Ammonites will be brought to light. He has, in short, begun the task—a by no means easy one—of cataloguing the Yorkshire type Ammonites of the Jurassic; a large and valuable series.

The first-fruits of his labours are given in the part now before us. The work is to appear in about 16 parts, each containing from 12 to 16 plates of the specimens more or less imperfectly described and figured by those pioneers in this field of study, Young and Bird, John Phillips and Martin Simpson. The works of the two first named are not easily procurable; those of Simpson are still more difficult to obtain, a fact the more to be regretted since they contain sterling work and matter of prime importance, though this fact is not generally realized.

Mr. Buckman has undertaken the task of editing these early contributions, supplementing the original descriptions by very beautiful photographs of the specimens described—and most of these figures appear now for the first time—and by concise editorial comments.

The section on Terminology will no doubt be gratefully received; nevertheless it bears a most forbidding aspect, and we confess we cannot see the value of a large percentage of the terms here set forth. They certainly do nothing towards elucidating the study, and if they fail in this they are indeed useless. But in this perhaps the author, and others, will not agree. Be this as it may, the work when completed will prove of the highest value to all students of the group.

THE LONDON, EDINBURGH, AND DUBLIN

PHILOSOPHICAL MAGAZINE

AND

JOURNAL OF SCIENCE.

A JOURNAL DEVOTED TO PHYSICS, ASTRONOMY, MECHANICS,
CHEMISTRY, MINERALOGY, AND THE ALLIED SCIENCES.

MONTHLY, PRICE 2s. 6d.

Complete sets (unbound) may be obtained. Prices on application.

The *First Series*, in 68 volumes, from 1798 to 1826. A few imperfect copies only on hand.

The *Second Series*, in 11 volumes, from 1827 to 1832.

The *Third Series*, in 37 volumes, from 1832 to 1850.

The *Fourth Series*, in 50 volumes, from 1851 to 1875.

The *Fifth Series*, in 50 volumes, from 1876 to 1900.

TAYLOR and FRANCIS, Red Lion Court, Fleet Street.

THE ANNALS AND MAGAZINE

OF

NATURAL HISTORY,

INCLUDING

ZOOLOGY, BOTANY, AND GEOLOGY.

MONTHLY, PRICE 2s. 6d.

Complete sets (unbound) may be obtained at the following prices:—

The <i>First Series</i> , in 20 volumes, from 1838 to 1847.	Price £10.
The <i>Second Series</i> , in 20 volumes, from 1848 to 1857.	„ £10.
The <i>Third Series</i> , in 20 volumes, from 1858 to 1867.	„ £12.
The <i>Fourth Series</i> , in 20 volumes, from 1868 to 1877.	„ £12.
The <i>Fifth Series</i> , in 20 volumes, from 1878 to 1887.	„ £12.
The <i>Sixth Series</i> , in 20 volumes, from 1888 to 1897.	„ £12.

TAYLOR and FRANCIS, Red Lion Court, Fleet Street.

CONTENTS OF NUMBER 29.—*Eighth Series.*

	Page
LVII. Descriptions of some new Species of Heterocera from Tropical Africa. By HERBERT DRUCE, F.L.S. &c.	393
LVIII. A Revision of the Genus <i>Pelecorhynchus</i> of the Family <i>Tabanidæ</i> . By GERTRUDE RICARDO	402
LIX. Descriptions and Records of Bees.—XXVIII. By T. D. A. COCKERELL, University of Colorado.....	409
LX. Three new African Rodents. By OLDFIELD THOMAS	419
LXI. Notes on some Palm-Civets. By ERNST SCHWARZ	422
LXII. Two new Mammals from the Malay Peninsula. By OLDFIELD THOMAS	424
LXIII. Some Remarks on the Teleostean Caudal Fin. By RICHARD H. WHITEHOUSE, M.Sc., University of Birmingham	426
LXIV. A Preliminary Note on the <i>Alciopinae</i> , <i>Tomopteridæ</i> , and <i>Typhloscolecidæ</i> from the Atlantic adjacent to Ireland. By R. SOUTHERN, B.Sc., Irish National Museum, Dublin	428
LXV. Descriptions of new African Moths. By Sir GEORGE F. HAMPSON, Bart., F.Z.S., &c.	430

BIBLIOGRAPHICAL NOTICE.

Yorkshire Type Ammonites. Edited by S. S. BUCKMAN, F.G.S. . . 464

. It is requested that all Communications for this Work may be addressed, post-paid, to the Care of Messrs. Taylor and Francis, Printing Office, Red Lion Court, Fleet Street, London.

THE ANNALS
AND
MAGAZINE OF NATURAL HISTORY,
INCLUDING
ZOOLOGY, BOTANY, AND GEOLOGY.



CONDUCTED BY

ALBERT C. L. G. GÜNTHER, M.A., M.D., Ph.D., F.R.S.,
WILLIAM CARRUTHERS, Ph.D., F.R.S., F.L.S., F.G.S.,

AND

WILLIAM FRANCIS, F.L.S.

BEING A CONTINUATION OF THE "ANNALS" COMBINED WITH
MESSRS. LOUDON AND CHARLESWORTH'S "MAGAZINE OF NATURAL HISTORY."

WITH TWO PLATES.

Illustrative of Miss Hilda M. Bishop's Paper on the Gastropod Foot and
Branchial Cavity.

LONDON:

TAYLOR AND FRANCIS, RED LION COURT, FLEET STREET.

Sold by Simpkin, Marshall, Hamilton, Kent, & Co., Ltd.; Baillière, Paris;
Hodges, Figgis, & Co., Dublin; and Asher, Berlin.

Vol. I. Part I. Price 4s.

BULLETIN OF ENTOMOLOGICAL RESEARCH

Issued by the Entomological Research Committee (Tropical Africa),
appointed by the Colonial Office.

TAYLOR and FRANCIS, Red Lion Court, Fleet Street, E.C.

THE FLORA OF THE PRESIDENCY OF BOMBAY.

Published under the authority of the Secretary of State for India in Council.

By THEODORE COOKE, C.I.E.,

M.A., M.A.I., LL.D., F.L.S., F.Z.S., &c.

FORMERLY PRINCIPAL OF THE COLLEGE OF SCIENCE AT POONA AND DIRECTOR
OF THE BOTANICAL SURVEY OF WESTERN INDIA.

Vol. I., Part I. 8s., Part II. 9s., Part III. 10s.

Vol. II., Parts I. & II. 9s. each, Parts III. & IV. 8s. each, Part V. 12s.

TAYLOR and FRANCIS, Red Lion Court, Fleet Street, E.C.

BIOLOGIA CENTRALI-AMERICANA.

Edited by F. DUCANE GODMAN.

SUBJECTS IN PROGRESS.

ZOOLOGY.

Coleoptera. Vol. IV. part 3 (RHYNCHOPHORA: Curculionidæ). By
D. SHARP. (Pp. 1-168; pls. i.-vi.)

Coleoptera. Vol. IV. part 7 (RHYNCHOPHORA: Curculionidæ, *continued*).
By G. C. CHAMPION. (Pp. 1-150, pls. i.-vi.)

Lepidoptera Heterocera. Vol. IV. By LORD WALSHINGHAM. (Pp. 1-40,
pl. i.)

The Price of each Part is 21s.

London: Published for the Editor by DULAU & Co., Soho Sq., W.

KIRBY'S SYNONYMIC CATALOGUES OF INSECTS.

SUPPLEMENT TO DIURNAL LEPIDOPTERA. 1871-
1877. 8s. 6d. net.

LEPIDOPTERA HETEROCCERA. — SPHINGES AND BOM-
BYCES. 1892. £2 2s. net.

NEUROPTERA ODONATA. 1890. 16s. net.

TAYLOR and FRANCIS, Red Lion Court, Fleet Street, E.C.

THE ANNALS

MAGAZINE OF NATURAL HISTORY.

AND

[EIGHTH SERIES.]

No. 30. JUNE 1910.

LXVI.—*Descriptions of new African Moths.*
By Sir GEORGE F. HAMPSON, Bart., F.Z.S., &c.

[Continued from p. 464.]

Stauropus atriguttata, sp. n.

Antennæ of female bipectinate with rather long branches to near apex, which is simple.

♀. Head ochreous white; palpi with the second joint above and sides of frons black-brown; antennæ rufous; thorax pale yellow-green mixed with brown; pectus and legs ochreous white, the pectus in front and fore tibiæ on inner side brown; abdomen fuscous, the ventral surface ochreous white tinged with brown. Fore wing pale ochreous suffused with yellow-green and slightly irrorated with reddish brown, some brown at base of inner margin; small subbasal black spots below costa and cell, the former with a brown spot before it; a double incurved slightly waved brown ante-medial line, the inner line with black spot at costa, a black spot on an ochreous patch just beyond it below the cell; a black spot with an ochreous patch below it on subcostal nervure towards end of cell; a slight ochreous discoidal bar, with black spot at lower angle of cell; postmedial line red-brown defined on outer side by ochreous, double between veins 6 and 4, oblique from costa to vein 6, then waved, oblique below vein 3; the postmedial area with a series of

black spots, bent inwards between veins 6 and 4 and oblique below vein 4; a subterminal series of black spots, the spot above vein 4 displaced inwards; cilia red-brown intersected with greenish at the veins. Hind wing pale red-brown; the costal area pale green, with a rufous postmedial bar, followed by a black patch near apex with some grey on it; cilia ochreous white; the underside with the inner area whitish.

Hab. S. NIGERIA, Lagos (*Strachan*), 1 ♀ type; MASHONALAND (*Dobbie*), 1 ♀. *Exp.* 48–62 mm.

Nearest to *S. viridescens*, Wlk., from India.

Stauropus rivata, sp. n.

♀. Head and tegulæ white mixed with yellow-green and some rufous; palpi above and lower part of frons rufous; antennæ rufous; patagia green irrorated with black; thorax rufous; pectus and legs ochreous tinged with rufous; abdomen whitish tinged with rufous. Fore wing whitish suffused with pale yellow-green and slightly irrorated with black-brown; the base bright yellow-green defined by the double black oblique and irregularly sinuous subbasal line; antemedial line obsolescent, brown, angled outwards below costa and cell and excurved above inner margin; medial line strong, brown, bent inwards in cell, then dentate and excurved above inner margin; postmedial line strong, brown, angled outwards below costa, then incurved, angled outwards at vein 4, then oblique and dentate, another line beyond it defined on outer side by white, angled outwards just below costa, oblique to vein 6, incurved to vein 4, then oblique and minutely dentate; subterminal line slight, dark, defined on inner side by some white and on outer by brown suffusion from costa to vein 4 and towards tornus, bent inwards between veins 6 and 4 and below vein 2 and outwards to near termen between veins 4 and 2; cilia brown slightly intersected by ochreous at the veins. Hind wing pale brown, the cilia with ochreous mixed; the underside with the cell and inner area ochreous white.

Hab. S. NIGERIA, Akassa (*Lugard*), 1 ♀ type. *Exp.* 58 mm.

Nearest to *S. viridescens*, Wlk., from India.

Stauropus calliope, sp. n.

Head and thorax bright yellow-green irrorated with black, the mesothorax with black-brown patch; palpi rufous, whitish in front and black behind; frons with some black at sides; antennæ black with the branches rufous; pectus and

legs ochreous white mixed with rufous, the tibiæ green above; abdomen black-brown, the extremity green, with some black hairs, the ventral surface yellowish white. Fore wing bright yellow-green irrorated with black; subbasal line double, black, excurved just below costa, at middle, and above inner margin; antemedial line slight, double, black, irregularly waved, the lines wider apart at costa, angled outwards in lower part of cell and at vein 1, a slight streak of white scales beyond it in submedian fold; orbicular and reniform faintly defined by white scales, the former amphora-shaped, the latter narrow, an oblique black striga above it from costa; postmedial line double, black, waved, oblique, somewhat bent inwards between veins 6 and 4, some black points beyond it on costa; subterminal line black, with a brown patch before it between veins 6 and 4, where it is incurved, and a smaller patch in submedian interspace, dentate at veins 4, 3, 2, and ending at tornus; cilia chequered brown and green. Hind wing pale tinged with red-brown, especially on inner area, the veins darker; cilia whitish at tips; the underside ochreous white, with a faint red-brown tinge on costal area.

Hab. NATAL, Durban (*Leigh*), 2 ♂, 1 ♀ type. *Exp.*, ♂ 50, ♀ 60 mm.

Larva. Whitish suffused with purplish pink and with numerous fine white rivulet lines enclosing irregular spaces, the ventral surface pale; eighth and ninth abdominal somites with patch of small white spots emitting an oblique streak to a lateral triangular patch on seventh somite; head with pair of black fasciæ; stigmata black ringed and centred with white; second thoracic somite with pair of long subdorsal horns.

Nearest to *S. viridescens*, Wlk.

Stauropus atribasalis, sp. n.

♂. Head and thorax dark reddish brown mixed with some whitish; palpi whitish in front; pectus and legs pale red-brown mixed with whitish; abdomen ochreous white suffused with red-brown, the hair at base of dorsum black-brown. Fore wing whitish tinged with pale yellow-green and irrorated with black-brown, the basal area suffused with black-brown bounded by the double oblique waved black subbasal line, angled inwards in cell to near base; antemedial line represented by an inwardly oblique black-brown striga from costa; some slight black-brown marks on discocellulars and above end of cell; postmedial line very indistinct, dark, oblique diffused and dentate from costa near apex to vein 4, where it

is angled outwards, then again oblique and with a slight spot on it below vein 2; a subterminal blackish line, arising from termen just below apex and slightly waved at veins 4, 3, 2; cilia chequered with brownish. Hind wing white, with two diffused brown bars from costa towards apex; the hair of inner area slightly tinged with rufous.

Hab. NATAL, 1 ♂ type. *Exp.* 44 mm.

Stauropus melanosticta, sp. n.

Head and thorax pale yellow-green; palpi, frons, and antennæ rufous, the palpi black above; some chocolate-brown on vertex of head, behind the tegulæ, and on upper edge of patagia; pectus and legs yellowish tinged with rufous; abdomen yellowish suffused with rufous, the extremity green irrorated with brown. Fore wing pale yellow-green irrorated with black; a series of small red-brown spots on costa; a subbasal brown striga below the cell, followed by a black spot above vein 1; an oblique antemedial series of slight blackish spots bent outwards to costa, sometimes with a black streak from it to subterminal line in submedian fold; orbicular and reniform faintly defined by raised greenish-white scales, closely approximated, the latter narrow; postmedial line slight, blackish, bent outwards below costa, then dentate, oblique below vein 4, traces of another dentate line beyond it; subterminal line formed by a series of small rather dentate black spots, with more produced spots below veins 7 and 4; a crenulate black line just before termen; cilia brown, with a series of green points. Hind wing yellowish tinged with rufous, the costal area towards apex whitish, with three rufous bars; cilia chequered with whitish; the underside white.

Hab. S. LEONE (*Bartlett*), 1 ♂; GOLD COAST, Kumasi (*Whiteside*), 1 ♂, 1 ♀ type. *Exp.* 40–42 mm.

Allied to *S. vernalis*, Dist.

Stauropus octoginta, sp. n.

♂. Head and thorax grey-green mixed with white and fuscous; palpi white in front, black behind; antennæ brownish, the shaft barred with white; tegulæ white at tips; pectus and legs white mixed with blackish; abdomen white, dorsally suffused with brown and with some black hair at base, the extremity grey-green mixed with black, the ventral surface tinged with yellow. Fore wing grey-green thickly irrorated with black; subbasal line black, angled

outwards below costa and cell and ending at vein 1 ; ante-medial line indistinctly double, blackish, inwardly oblique from costa to median nervure, then bent outwards and again inwards to inner margin, a rounded white patch before it below the cell, and a rounded patch defined by white beyond it, followed by a black streak in submedian fold to beyond postmedial line ; orbicular and reniform closely approximated, defined by white and forming the figure 80 ; post-medial line double, black, angled outwards below costa, then dentate, somewhat oblique, and the outer line bent outwards to inner margin, some alternating black and white marks beyond it on costa, and some slight black marks below costa ; subterminal line black slightly defined on outer side by white, minutely and irregularly waved, slightly excurved below costa and at middle ; cilia chequered blackish and grey-green. Hind wing white ; two diffused blackish bars from costa towards apex ; some ochreous hair on inner margin ; the underside with slight black irroration on costa and a patch of black scales at middle of costal area.

Hab. TRANSVAAL (*Cholmley*), 1 ♂ type. *Exp.* 40 mm.

Allied to *S. vernalis*, Dist.

Stauropus griseiviridis, sp. n.

♂. Head and thorax pale grey-green slightly mixed with whitish and brown ; palpi white tinged with brown ; frons fuscous below, white above ; antennæ rufous, the basal joint white ; pectus and legs white tinged with ochreous ; abdomen white tinged with ochreous and dorsally banded with brownish, the hair at base black, the extremity green irrorated with black. Fore wing pale grey-green tinged with brown in parts and slightly irrorated with blackish ; subbasal line formed of black scales defined by whitish, inwardly oblique, ending just below the cell where there is a black point beyond it ; antemedial line double, black filled in with whitish, inwardly oblique from costa to vein 1, then bent outwards ; traces of closely approximated orbicular and reniform stigmata defined by whitish, an oblique black striga above them from costa ; postmedial line indistinctly double, blackish, oblique and irregularly waved, from costa towards apex, somewhat incurved at discal fold and below vein 2 ; a sinuous black subterminal line, somewhat angled outwards at veins 4, 3, 2, then bent inwards ; cilia chequered brown and whitish. Hind wing white, the veins tinged with brown ; the costal area grey-green crossed by slight double sinuous blackish postmedial and subterminal lines ; the underside white.

Hab. CAPE COLONY, 1 ♂ type. *Exp.* 40 mm.
Closely allied to *S. vernalis*, Dist.

Stauropus thalassina, sp. n.

♂. Head and thorax pale grey-green; palpi white, black above; frons black at sides; antennæ white, the branches rufous; a black band behind tegulæ; pectus and legs white, the fore tibiæ grey-green, the tibiæ and tarsi with some black; abdomen white dorsally tinged with green and banded with black, the hair at base black. Fore wing pale grey-green; subbasal line formed by black scales, oblique, bent outwards and terminating at submedian fold; antemedial line strong, black defined on inner side by white, oblique, sinuous, excurved in cell; some black scales on discocellulars; medial line black, rather diffused, angled outwards at vein 6, then dentate, oblique, confluent with the antemedial line at inner margin; postmedial line black defined on outer side by white, slightly bent outwards below costa, then oblique, sinuous, angled outwards at vein 4 and bent outwards to inner margin, some black points beyond it on costa; a subterminal series of rather lunulate black spots defined on inner side by white, the spot above vein 4 further from termen; a series of small black spots just before termen and a series on the cilia. Hind wing white, the hair on inner area tinged with ochreous; a slight oblique postmedial blackish striga from costa, the costal area beyond it pale grey-green with a diffused black patch at apex with faint diffused ochreous-brown subterminal shade from it to vein 1; the underside white with traces of medial and postmedial dark bars from costa.

Hab. MASHONALAND, Salisbury (*Marshall*), 1 ♂ type.
Exp. 42 mm.

Stauropus leucosticta, sp. n.

♂. Head, thorax, and abdomen chocolate-brown slightly mixed with greyish, the last with blackish crests towards extremity. Fore wing chocolate-brown overlaid with greyish-ochreous hairy scales; a white point at base of vein 1; three obliquely placed antemedial points towards costa and a point on vein 1; an obliquely curved postmedial series of small wedge-shaped white spots on the veins with blackish points before and beyond them. Hind wing chocolate-red with some grey hair and slight dark bars on costal area towards apex.

Hab. S. NIGERIA, Old Calabar (*Crompton*), 1 ♂ type.
Exp. 34 mm.

Allied to *S. falsa*, Holl.

Stauropus trichosa, sp. n.

♂. Head, thorax, and abdomen chocolate-brown mixed with greyish; palpi blackish, pale in front; pectus, legs, and ventral surface of abdomen reddish ochreous, the fore legs redder. Fore wing chocolate-brown suffused with dark brown and slightly irrorated with hairy greyish scales, the costal area rather redder and irrorated with ochreous; a black point in end of cell and discoidal bar; traces of a double dark postmedial line, oblique from costa to vein 6, angled inwards at discal fold and outwards at vein 4, then again oblique; some ochreous points on costa towards apex; traces of a dark subterminal line, excurved at middle; a series of ochreous points on the cilia. Hind wing whitish tinged with chocolate-brown, the costal area deep chocolate-brown with some white hairs; an indistinct whitish postmedial band, excurved at middle; cilia whitish at tips; the underside ochreous white faintly tinged with rufous.

Hab. GOLD COAST, Kumasi (*Whiteside*), 1 ♂ type. *Exp.* 38 mm.

Stauropus agramma, sp. n.

Antennæ of female very minutely serrate.

♀. Head and thorax white with some black and brown hairs; palpi slight, black at sides; abdomen white slightly irrorated with black. Fore wing white rather thickly irrorated with black-brown; a subterminal series of small indistinct brown spots, slightly excurved below vein 7 and at middle. Hind wing white slightly tinged and irrorated with brown; traces of a diffused brown postmedial line; the underside white.

Hab. MASHONALAND, Salisbury (*Marshall*), 1 ♀ type. *Exp.* 46 mm.

Stauropus steniptera, sp. n.

Antennæ of male bipectinate with very short branches, the apical third somewhat laminate and pilose.

♂. Head and thorax brown mixed with grey; antennæ white, the branches tinged with rufous; abdomen reddish brown tinged with fuscous, some grey hair at base and extremity; hinder part of pectus, hind legs, and ventral surface of abdomen white. Fore wing white very thickly irrorated with dark brown; a diffused straight dark subbasal line; antemedial line dark, diffused towards costa, bent outwards below submedian fold; postmedial line rather diffused, dark, with short dark streaks beyond it on the veins,

inwardly oblique between veins 4 and 2, then again erect, a faint diffused oblique shade beyond it from costa to vein 2 towards which it narrows; a waved brown subterminal line. Hind wing white, the hair on inner area faintly tinged with brown.

Hab. MASHONALAND, Salisbury (*Marshall*), 2 ♂ type. *Exp.* 36 mm.

Stauropus pergrisea, sp. n.

♂. Head and thorax grey mixed with brown; palpi and sides of frons black-brown, the head between antennæ white with a black streak; antennæ white, the branches tinged with rufous; abdomen brown mixed with fulvous, the extremity whitish; pectus, legs, and ventral surface of abdomen white mixed with brown. Fore wing white rather thickly irrorated with brown; subbasal line brown, rather diffused, angled outwards below costa, then oblique, ending at submedian fold; antemedial line brown, diffused towards costa, angled outwards in cell and inwards in submedian fold; postmedial line brown, rather diffused, bent outwards below vein 2 to near tornus; subterminal line indistinct, brown, crenulate to termen at the veins. Hind wing white, the hair on inner area slightly tinged with brown.

Hab. NATAL, Durban (*Whyte*), 1 ♂ type. *Exp.* 44 mm.

Stauropus pulverulenta, sp. n.

♂. Head and thorax grey-white tinged with brown; palpi and front of pectus tinged with fuscous; abdomen fulvous yellow with obscure brownish bands and some brown and grey hair at base, the ventral surface white. Fore wing white thickly irrorated with reddish brown; a faint brown subbasal bar from costa; antemedial line indistinct, brown, rather diffused, oblique from costa to vein 1; postmedial line brown, rather diffused, bent inwards below vein 4, then oblique to inner margin near tornus; an indistinct lunulate subterminal brown line. Hind wing white.

♀. Abdomen with the two terminal segments black-brown below and clothed with smooth scales instead of long white hair.

Hab. GOLD COAST, Ashanti (*Dudgeon*), 1 ♂, Kumasi (*Whiteside*), 4 ♂, 2 ♀ type. *Exp.*, ♂ 30-40, ♀ 42-48 mm.

Stenostaura polioplaga, sp. n.

Palpi extending to just beyond the frons; antennæ of

male bipectinate with long branches to near apex which is simple.

♂. Head ochreous mixed with red-brown; antennæ red-brown; thorax red-brown with some ochreous at sides; pectus, legs, and abdomen ochreous strongly tinged with rufous, the last with the hair at base tipped with blackish. Fore wing red-brown mixed with ochreous, the basal and inner areas more ochreous; subbasal line indistinctly double filled in with ochreous and with black points at the veins, excurved in cell and at vein 1; antemedial line double, the outer line with black points at the veins, crenulate and somewhat inwardly oblique; a large round grey-white patch at end of cell; postmedial line double filled in with ochreous, minutely waved, excurved below costa, then oblique, the veins beyond it streaked with black; subterminal line represented by a slight oblique ochreous striga from apex, points on veins 7, 6, and points on veins 4, 3, 2, and 1 with a slight dark line between them, a short ochreous streak before it below vein 4 with an oblique line from its inner edge to the ochreous on inner area; cilia chequered ochreous and blackish. Hind wing ochreous suffused with rufous, the cilia pale at tips; the underside ochreous white.

Hab. S. NIGERIA, Arochuku (*Dudgeon*), 1 ♂ type. *Exp.* 28 mm.

Fentonia xylostola, sp. n.

Antennæ of female with short branches, the terminal third ciliated.

Head and tegulæ ochreous white slightly mixed with red-brown; thorax and abdomen red-brown slightly mixed with white; pectus whitish; tarsi with pale rings; abdomen with the ventral surface ochreous white. Fore wing red-brown thickly irrorated with grey; subbasal line formed by black scales, excurved, from costa to vein 1; antemedial line formed of raised black scales, incurved at submedian fold and angled outwards above inner margin; postmedial line formed by sparse black scales, oblique outwardly to costa, then excurved to vein 2, then incurved; traces of a whitish subterminal line, slightly angled outwards below vein 7 and at middle; an indistinct blackish crenulate line just before termen. Hind wing red-brown, the cilia whitish at tips; the underside paler red-brown, the inner area ochreous white.

Hab. SIERRA LEONE (*Bartlett*), 2 ♂ type. *Exp.* 46 mm.

Genus PHYLLALIODES, nov.

Type *P. agramma*.

Proboscis absent; palpi porrect to just beyond frons and fringed with long hair; frons smooth, clothed with long hair; eyes large, round; antennæ of male bipectinate with long branches to apex; thorax clothed with long rough hair and without crests; tibiæ clothed with long hair; abdomen with some rough hair at base and without crests. Fore wing with the apex rounded, the termen obliquely curved and not crenulate; vein 3 from before angle of cell; 5 from middle of discocellulars; 6, 7 from upper angle; 8, 9, 10 stalked; 11 from cell. Hind wing with veins 3, 4 stalked; 5 from middle of discocellulars; 6, 7 stalked; 8 approximated to the cell to near extremity.

Fore wing of type with vein 7 forking well before termen on right side only.

Phyllaliodes agramma, sp. n.

♂. Head and thorax dark red-brown; abdomen brownish white; pectus, legs, and ventral surface of abdomen dark brown. Fore wing dark red-brown slightly irrorated with white. Hind wing white slightly tinged with brown, the veins browner; the underside with the costal area suffused with brown.

Hab. NATAL, Pt. Shepstone (*Aspinall*), 1 ♂ type. *Exp.* 44 mm.

Antheua croceipuncta, sp. n.

♂. Head and thorax bright yellow; antennæ rufous; palpi black fringed with crimson hair; pectus in front crimson; femora fringed with crimson hair; fore and mid tibiæ and tarsi black, the hind tibiæ black below, white above fringed with brownish hair; abdomen orange banded with black, the ventral surface pale yellow. Fore wing bright yellow; an oblique antemedial series of four orange-red points and a postmedial series of seven points, oblique below vein 4. Hind wing pale yellow, the inner and terminal areas tinged with orange; cilia white; the underside yellowish white, the inner area yellower.

Hab. GAZALAND, Mt. Chirinda (*Marshall*), 1 ♂ type. *Exp.* 48 mm.

Antheua basipuncta, sp. n.

♂. Head and thorax pale yellow; antennæ pale fulvous; palpi black fringed with crimson hair; frons crimson with

a white patch at middle; pectus in front crimson; femora fringed with crimson hair, tibiae and tarsi black and white mixed; abdomen fulvous banded with black, the ventral surface pale yellowish. Fore wing pale yellow; subbasal orange-red points below costa and cell; an oblique antemedial series of three points and a postmedial series of seven points, oblique below vein 4. Hind wing white, the inner margin with some yellow hair.

♀. Head, thorax, and fore wing yellower; hind wing yellow suffused with brown, the inner margin and cilia yellow; underside of both wings suffused with brown, the margins narrowly yellow.

Hab. MASHONALAND (*Dobbie*), 1 ♂, 1 ♀ type; TRANSVAAL (*Pead*), 1 ♂. *Exp.*, ♂ 52-56, ♀ 62 mm.

Antheua albida, sp. n.

♂. Head and thorax yellowish white; antennae fulvous; palpi black fringed with crimson hair; frons crimson at sides; pectus crimson in front; femora fringed with crimson hair; tibiae and tarsi black below, mostly white above; abdomen fulvous orange banded with black, the ventral surface white. Fore wing yellowish white; an oblique antemedial series of three faint orange-yellow points and a postmedial series of seven points, oblique below vein 4. Hind wing white, the inner area with some ochreous hairs.

♀. Fore wing with the orange points more distinct, the cilia pale yellow; hind wing pale yellow; the underside yellow, the fore wing faintly tinged with brown except at margins.

Hab. N. ANGOLA; MASHONALAND, Salisbury (*Marshall, Dobbie*), 6 ♂, 2 ♀ type. *Exp.*, ♂ 52-54, ♀ 56-62 mm.

Antheua trivitta, sp. n.

♂. Head and thorax pale ochreous yellow; palpi and sides of frons black; some black behind the eyes; antennae rufous; femora black above, the tarsi blackish above; abdomen deep rufous above, black at sides and extremity and whitish below. Fore wing pale ochreous yellow; short black streaks from base on median nervure and above inner margin and a short streak beyond lower angle of cell above vein 3. Hind wing white with some ochreous hair at base of inner margin; the cilia tinged with yellow at base.

Hab. ABYSSINIA (*Degen*), 1 ♂ type. *Exp.* 54 mm.

Dinara encausta, sp. n.

♂. Head, tegulæ, and prothorax pale yellow, palpi and sides of frons deep rufous, the frons tinged with rufous; antennæ rufous; thorax rufous with some white hair on patagia and metathorax; pectus and legs red-brown; abdomen rufous with some black-brown hair at base, a lateral series of blackish spots towards extremity and a sublateral series, the anal tuft and ventral surface pale yellow. Fore wing yellow; a subbasal black point in cell; a rufous fascia on inner area except at base; a wedge-shaped fascia from median nervure near base to termen between veins 4 and 2, where it is confluent with the fascia on inner margin and a triangular patch from termen below apex; cilia grey-brown with slight white tips. Hind wing grey-brown, rather paler at base; the underside ochreous, with some brownish suffusion from median nervure near base to termen between veins 6 and 2.

Hab. MASHONALAND, Salisbury (*Marshall, Dobbie*), 8 ♂ type, Umtali (*Marshall*), 1 ♂; GAZALAND, Mt. Chirinda (*Marshall*), 5 ♂. *Exp.* 40–48 mm.

Zana bidentata, sp. n.

♂. Head and thorax black-brown mixed with grey and some reddish yellow; antennæ reddish yellow; abdomen fulvous brown, the base and extremity creamy white; the ventral surface creamy white tinged with rufous. Fore wing pale yellow suffused with rufous, the terminal half of inner area to the cell and obliquely from beyond the cell to termen below apex fuscous brown tinged with grey and irrorated with black, interrupted by a creamy-white streak defined below by rufous on vein 4 from just beyond angle of cell to termen, the upper edge of this dark area bidentate at veins 6 and 7; cilia chequered black-brown and yellowish white. Hind wing white, the cilia with some brown scales.

Hab. S. NIGERIA, Olokemeji (*Dudgeon*), 1 ♂ type. *Exp.* 44 mm.

Closely allied to *Z. gallans*, Karsch.

Zana anodonta, sp. n.

♂. Head and thorax pale yellow, the pro- and mesothorax with some brown hair, the metathorax mostly brown; palpi brown; antennæ rufous; pectus and legs with brown hair mixed; abdomen fulvous, the base and extremity whitish, the anal tuft ochreous, the ventral surface white.

Fore wing creamy white, the costa tinged with fulvous; a dark brown streak defined below by fulvous along median nervure and above vein 4 from base to termen; the inner margin grey-brown and rufous except at base; the area from origin of vein 2 below the dark streak to tornus suffused with grey and irrorated with a few black scales; an obliquely downcurved dark brown streak from termen below apex to vein 6, defined below by rufous and with a triangular patch of grey suffusion irrorated with black below it extending to the whitish streak which defines the dark medial streak above; cilia grey mixed with some black. Hind wing white; the cilia chequered faintly with brown.

Hab. TRANSVAAL, White R. (Cooke), 1 ♂ type. *Exp.* 42 mm.

Allied to *Z. gallans*, Karsch.

Zana ruficosta, sp. n.

♀. Head and thorax pale yellow with fuscous streaks above patagia; palpi rufous; fore femora and tibiae mostly brown, the tarsi banded with black; abdomen fulvous orange, the extremity and ventral surface yellowish white; subdorsal black spots on third, fourth, and fifth segments and a lateral series. Fore wing yellow; the terminal half of costal area rufous, with a wedge-shaped black-brown patch below it from before end of cell to termen below apex, its lower edge indented by a small spot of the ground-colour at upper angle of cell and dentate just before termen below vein 6; a dark brown fascia along median nervure and below vein 4 from base to termen, its lower edge with four slight dentations from before vein 2 to vein 3; a rather diffused brown fascia on inner margin except at base; the cilia with a series of blackish points. Hind wing silky white; the underside with the costal area tinged with orange-yellow.

Hab. GOLD COAST, Ashanti (Dudgeon), 1 ♀ type. *Exp.* 34 mm.

Allied to *Z. aurofodinæ*, Dist.

Genus AMPHIPHALERA, nov.

Type *A. leuconephra*.

Proboscis fully developed; palpi short, porrect; frons smooth; eyes large, round; antennæ simple and laminate in both sexes; thorax clothed with hair only and without crests; tibiae moderately fringed with hair, the hind tibiae with two pairs of spurs; abdomen smoothly scaled and without crests. Fore wing rather long and narrow, the apex

rounded, the termen evenly curved and not crenulate; vein 3 from before angle of cell; 5 from just above middle of discocellulars; 9 from 10 anastomosing with 8 to form a long areole, 6 from the areole; 11 from cell. Hind wing with veins 3, 4 from angle of cell; 5 from middle of discocellulars; 6, 7 stalked; 8 approximated to the cell to beyond middle.

Amphiphalera leuconephra, sp. n.

Head and thorax white mixed with brown; abdomen fulvous yellow, greyish at extremity, the ventral surface yellowish white faintly banded with brown. Fore wing pale silky grey-brown irrorated with white; indistinct antemedial dark points on the veins; reniform white, oblique bar-shaped, the costal area suffused with white from well before to well beyond it; a postmedial series of slight dark points on the veins, arising just beyond the reniform and obliquely incurved below vein 4; a faint whitish subterminal line, incurved below vein 7 and at middle, then oblique. Hind wing yellowish white, the terminal area pale silky brown, broad at costa, narrowing to tornus.

Hab. SIERRA LEONE (*Cator*), 1 ♂; GOLD COAST, Volta R. (*Dudgeon*), 1 ♀ type. *Exp.* 46 mm.

Paradiastema pulverea, sp. n.

Antennæ of male with rather long uniseriate branches to apex, of female with short branches.

♂. Head and thorax creamy white, the patagia with some fulvous; palpi blackish at tips; antennæ black; legs with brown hair mixed; abdomen fulvous, the ventral surface whitish slightly banded with black. Fore wing whitish thickly irrorated with rufous, the termen narrowly and cilia rufous. Hind wing silky white with a yellowish tinge.

♀. Abdomen with the anal tuft brownish white, with a blackish band at base; fore wing sometimes very thickly irrorated with rufous.

Hab. GOLD COAST, Cape Coast Castle (*Higlett*, *Dudgeon*), 1 ♂, 4 ♀ type; S. NIGERIA (*Dudgeon*), 2 ♀. *Exp.* 46-52 mm.

Resembles *P. nigrocincta*, Auriv., but the antennæ of female are pectinate instead of laminate.

Genus LAMORIODES, nov.

Type *L. metaleuca*.

Proboscis fully developed; palpi upturned, rather slenderly scaled and reaching to just above vertex of head; frons with

pointed conical prominence above; eyes large, round; antennæ of male long and ciliated; thorax clothed chiefly with scales and without crests; build very slender; legs very long, the tibiæ smoothly scaled and with the spurs long; abdomen long and slender and without crests. Fore wing very long and narrow, the apex rounded, the termen evenly curved and not crenulate; veins 3 and 4 from angle of cell; 5 from middle of discocellulars; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 touching 10 just beyond the areole. Hind wings with veins 3, 4 stalked; 5 from middle of discocellulars; 6, 7 stalked; 8 approximated to the cell to near middle.

Leucania angustipennis, Saalm. Lep. Madag. fig. 252, possibly belongs to this genus.

Lamoriodes metaleuca, sp. n.

♂. Head and thorax blackish brown; pectus and abdomen grey-white. Fore wing grey-brown tinged with fuscous at base, the veins and discal fold streaked with black; traces of an obliquely curved antemedial line; a black discoidal point; postmedial line indistinct and faintly defined by greyish on outer side, excurved from costa to vein 4, then strongly incurved to inner margin near antemedial line; a fine black terminal line. Hind wing creamy white, the terminal area tinged with brown; a fine dark terminal line; the underside with dark discoidal point.

Hab. SIERRA LEONE (*Clements*), 1 ♂ type. *Exp.* 22 mm.

Lamoriodes metaphæa, sp. n.

♂. Head and thorax black-brown; pectus and abdomen greyish fuscous. Fore wing fuscous brown, the veins and discal fold streaked with blackish; traces of a dark antemedial line bent inwards below submedian fold and with white points at median nervure and vein 1; traces of a dark postmedial line with white points at the veins, very oblique below vein 6 to middle of inner margin; a terminal series of minute black spots defined on inner side by white points. Hind wing fuscous brown with a slight pale line at base of cilia.

Hab. GOLD COAST, Kumasi (*Whiteside*), 1 ♂ type. *Exp.* 28 mm.

Scrancia discalis, sp. n.

Antennæ of female bipectinate with moderate branches to apex; fore wing with the areole very long.

♀. Head and thorax ochreous suffused with red-brown, the upper edge of patagia darker; palpi black on inner side; antennæ with the shaft whitish, the branches brown; fore legs streaked with dark brown on inner side; abdomen ochreous tinged with rufous, the crest at base with dark brown mixed. Fore wing ochreous, suffused in parts with red-brown and irrorated with a few black scales, especially on the veins; a diffused black-brown patch in submedian interspace to origin of vein 2, extending to just below vein 1 at base; an indistinct diffused oblique brown bar from costa before middle and oblique line from cell to vein 1; a rather quadrate black-brown patch in end of cell; the extremity of median nervure, discocellulars, and base of veins arising from end of cell creamy white; a double oblique sinuous brown postmedial line filled in with creamy white from vein 7 to 2 with two faint oblique rufous lines from it to costa and one to inner margin, the veins beyond it with blackish streaks; a maculate blackish subterminal line from vein 7 to 2, angled outwards at vein 4, defined on inner side by pale yellow and with the area beyond it browner; a terminal series of black points. Hind wing creamy white, the termen tinged with brown from apex to vein 2; the underside with the costal area suffused and irrorated with brown.

Hab. BR. E. AFRICA, Taveta (Rogers), 2 ♀ type. *Exp.* 36 mm.

Scrancia stictica, sp. n.

Antennæ of female bipectinate with short branches to two-thirds length; fore wing with the areole short and broad.

♀. Head and thorax brown mixed with greyish; palpi dark above, whitish below; abdomen grey suffused with brown. Fore wing grey tinged with brown; a subbasal black point in submedian fold; a slight antemedial dark shade from submedian fold to inner margin, with a black point beyond it on vein 1; a black discoidal striga defined by greyish placed on a faint diffused medial brown shade, narrowing to a slight bar at costa; a rather oblique double postmedial series of black points on the veins from below costa to inner margin; the apical part of costal area suffused with fuscous; traces of a pale waved subterminal line defined on outer side by slight blackish marks on the veins, the area beyond it tinged with grey-brown; a terminal series of prominent black points. Hind wing whitish, the terminal area suffused with brown; a faint discoidal striga; cilia whitish; the underside whitish, the costa slightly irrorated

with brown, a faint discoidal striga and subterminal shade diffused to apex.

Hab. NATAL, Durban (*Clarke*), 1 ♀ type. *Exp.* 48 mm.

Allied to *S. accipiter*, Schaus.

Scrancia leucopera, sp. n.

Antennæ of female ciliated.

♀. Head, tegulæ, and vertex of thorax ochreous mixed with red-brown, the patagia and metathorax white; pectus and legs whitish; abdomen pale red-brown with white segmental lines, the ventral surface whitish. Fore wing pale red-brown irrorated with glittering scales, the base white, with oblique outer edge; some slight white suffusion on middle of costa, with two brown points beyond it; reniform white, elliptical, its centre slightly defined by brown; the apical part of costal area white, its lower edge angled just before termen, three slight brown spots on it at costa; post-medial dark points above veins 5, 4, 3, and a subterminal series of whitish points from the patch to inner margin, those on veins 4, 3 nearer the termen; a terminal series of small brown spots. Hind wing pale red-brown; a dark brown terminal line with whitish points at the veins; the underside whitish tinged with red-brown, the costal area irrorated with red-brown, the terminal area suffused with red-brown, a brown discoidal bar, curved postmedial line, and whitish subterminal line bent inwards to costa and ending on termen at vein 1.

Hab. S. NIGERIA, Old Calabar (*Crompton*), 1 ♀ type. *Exp.* 44 mm.

Scrancia atrifrons, sp. n.

♀. Head and thorax fuscous brown with a few whitish scales, the frons deep black; pectus grey; abdomen grey suffused with fuscous except at base. Fore wing fuscous brown; traces of sinuous black antemedial and medial lines; a faint whitish discoidal striga defined by black and with some ochreous before and beyond it; postmedial line indistinct, double, dentate and produced to black and white streaks on the veins; a fine black terminal line. Hind wing pale fuscous brown; the underside greyer.

Hab. TRANSVAAL (*Pead*), 1 ♀ type. *Exp.* 30 mm.

Allied to *S. africana*, Auriv., but the wings much shorter.

Gargetta xylochroa, sp. n.

Antennæ of male bipectinate with long branches to apex ; fore wing without fringe of hair on inner area below.

♂. Head and thorax brown mixed with ochreous and some fuscous ; antennæ pale ochreous ; abdomen ochreous suffused with brown. Fore wing ochreous suffused with brown and irrorated with a few black scales in submedian fold ; a subbasal black point below the cell ; faint traces of a diffused antemedial line, oblique from costa to submedian fold, then inwardly oblique ; a black point in cell towards extremity, with a very oblique dark shade to it from costa ; a slight blackish discoidal striga, with oblique shade to it from costa ; a very indistinct double sinuous postmedial line, the costa beyond it with pale points with fuscous between them, the veins beyond it with slight blackish streaks ; a pale subterminal shade, oblique from costa just before apex to submedian fold, then bent outwards to tornus ; a terminal series of black points. Hind wing pure white, with fine ochreous-brown terminal line with black points on it from apex to vein 2 ; the underside with the costa slightly tinged with ochreous.

Hab. BR. E. AFRICA, Kikuyu (*Crawshay*), 1 ♂ type. *Exp.* 32 mm.

Gargetta leuca, sp. n.

Antennæ of male bipectinate with long branches to apex ; fore wing without fringe of hair.

♂. Head and thorax white slightly tinged with rufous ; antennæ with the branches black at extreme base ; abdomen whitish tinged with brown. Fore wing ochreous faintly tinged with rufous and irrorated with a very few black scales, the costal edge brown. Hind wing semihyaline ochreous white.

Hab. GOLD COAST, Volta (*Dudgeon*), 1 ♂ type. *Exp.* 36 mm.

GENUS PSALISODES, nov.

Type *P. atrijsciata*.

Proboscis absent ; palpi porrect, extending about three times length of head and fringed with rather long hair below ; frons smooth ; eyes large, round ; antennæ of female bipectinate with long branches to apex and with tuft of very long hair from basal joint in front ; thorax clothed with hair only and without crests, the patagia with pointed tufts of hair from base of upper edge ; tibiæ moderately fringed with

hair; abdomen with some rough hair at base and without crests. Fore wing long and narrow, the costa highly arched towards apex, which is much produced, the termen very obliquely curved and not crenulate; veins 3 and 2 from close together towards angle of cell; 5 from middle of discocellulars; 9 from 10 anastomosing with 8 to form a very long areole; 6 from the areole; 11 from cell. Hind wing with veins 3, 4 from angle of cell; 5 from middle of discocellulars; 6, 7 stalked; 8 approximated to the cell to middle.

Psalisodes atrifasciata, sp. n.

♀. Head and thorax grey mixed with brown, some black on upper edge of patagia at base; antennæ with the shaft whitish, the branches rufous, the tufts from basal joint dark brown; abdomen grey suffused with reddish brown. Fore wing grey tinged with brown, especially at middle of costal area, and irrorated with a few black scales; a black fascia on basal half of median nervure defined below by white; two red-brown streaks in terminal half of cell, with a fine white streak between them; antemedial line double, excurved in cell to near its extremity, then angled inwards and black filled in with white to the extremity of the fascia, again strongly excurved in submedian fold and very oblique to vein 1 before middle, where it terminates; a white discoidal bar defined on inner side by black; the extremity of median nervure and bases of veins 5, 4, 3, 2 streaked with white; post-medial line whitish defined on each side by slight black points at the veins, arising at vein 5, straight to vein 2, then excurved to inner margin near tornus; an oblique series of black streaks on the veins defined by white at tips and with some red-brown between them from below apex to the post-medial line at vein 4, an oblique brown shade from the extremity of the streak on vein 4 to the postmedial line at vein 2; a terminal series of minute black points at the veins. Hind wing greyish suffused with brown; cilia white at tips.

Hab. BR. E. AFRICA, Taveta (*Rogers*), 2 ♀, Athi R. (*Betton*), 1 ♀ type. *Exp.* 28-36 mm.

Ramesa euzopherodes, sp. n.

Fore wing with vein 9 from 10 anastomosing with 8 to form a long areole; antennæ of female with short branches ending in a bristle.

♀. Head and thorax brown mixed with ochreous white; abdomen grey-brown, the ventral surface ochreous white. Fore wing ochreous white faintly tinged with red-brown, the

terminal area suffused with brown, with black streaks on the veins and brownish streaks in the interspaces; a black streak below median nervure to origin of vein 2; a double blackish medial line, almost obsolete towards costa and inner margin, very strongly excurved in cell to near its extremity, then angled inwards to extremity of the black streak, then again excurved, a black streak in submedian fold from it to the double waved postmedial line almost obsolete towards costa and inner margin; subterminal line very indistinct, pale, waved, obsolete towards costa and bent inwards below vein 4 to near the postmedial line. Hind wing ochreous white, the termen slightly tinged with brown from apex to vein 2; the underside with the costal area slightly irrorated with red-brown.

Hab. UGANDA, White Nile, Gondokoro (*Reynes Cole*), 1 ♀ type. *Exp.* 40 mm.

Allied to *R. macrodonta*, Hmps. n.

Ramesa dasychira, sp. n.

Fore wing with veins 9 and 10 anastomosing with 8 to form a moderate areole.

♀. Head and thorax brown mixed with grey, some yellowish white on vertex of head; tegulae black, with yellowish-white patch edged with black behind them; pectus, legs, and abdomen grey-brown, the tarsi ringed with whitish. Fore wing brown mixed with some grey and irrorated with black; the first line medial, black, waved, defined on inner side by grey-white, irrorated with large black scales, diffused inwards towards inner margin; a black discoidal bar; postmedial line black, defined on outer side by whitish, minutely dentate, bent inwards to costa; subterminal line waved, whitish; a terminal series of black striae. Hind wing whitish suffused with brown, the cilia whiter.

Hab. TRANSVAAL, White R. (*Cooke*), 1 ♀ type. *Exp.* 34 mm.

Allied to *R. macrodonta*, Hmps. n.

Genus NOTOXANTHA, nov.

Type *N. sesamiodes*.

Proboscis aborted, minute; palpi porrect, extending to just beyond the frons, which has a horseshoe-shaped prominence with raised edges; eyes large, round; antennae of male bipectinate with long branches to apex, of female ciliated; thorax clothed with hair only and without crests;

tibiæ moderately fringed with hair; abdomen without crests. Fore wing with the apex produced and acute, the termen evenly curved and not crenulate; veins 3, 4 from angle of cell; 5 from middle of discocellulars; 9 and 10 anastomosing with 8 to form a long areole, 6 from the areole; 11 from cell. Hind wing with vein 3 from before angle of cell; 5 from middle of discocellulars; 6, 7 stalked; 8 approximated to the cell to middle.

Notoxantha sesamiodes, sp. n.

Head chocolate-brown; thorax white slightly tinged with pink; legs brown on inner side; abdomen yellowish white suffused with fulvous except at extremity, the ventral surface tinged with brown. Fore wing pink sparsely irrorated with black, the costal edge, median nervure, and veins arising from it and vein 6 streaked with yellowish white. Hind wing yellowish white suffused with brown except at base, the terminal area and cilia tinged with pink; the underside tinged with pink except on inner area.

Hab. N. ANGOLA; MASHONALAND, Salisbury (*Marshall, Dobbie*), 2 ♂, 1 ♀ type; TRANSVAAL (*Pead*), 1 ♂. *Exp.*, ♂ 34, ♀ 40 mm.

Pydna rubritincta, sp. n.

Fore wing with veins 7, 8, 9, 10 stalked.

♀. Head and thorax grey mixed with brown, the metathorax rufous; fore femora black-brown on inner side; abdomen pale grey-brown. Fore wing greyish, ochreous sparsely irrorated with black, the interspaces suffused with rufous except on basal and costal areas; an obliquely curved postmedial series of black points on veins 6 to 1; a series of blackish points just before termen. Hind wing grey, the veins suffused with fuscous brown; the underside pale greyish irrorated with brown and with a slight fuscous tinge in and beyond lower part of cell.

Hab. NATAL, Durban (*Leigh*), 1 ♀ type. *Exp.* 41 mm.

Pydna flavida, sp. n.

Fore wing with the areole short, vein 10 from beyond the areole; antennæ of male with long branches.

♂. Head and thorax ochreous white; antennæ fulvous; palpi black at sides; pectus blackish in front; fore femora and tibiæ black on inner side, the tarsi with some black towards extremities; abdomen fulvous, the anal tuft and

ventral surface ochreous white. Fore wing ochreous white sparsely irrorated with black scales; subbasal points formed of black scales below costa and cell; traces of an obliquely curved antemedial series of points formed of black scales; a diffused patch of black scales in end of cell and some on discocellulars; an obliquely curved postmedial series of black points on the veins and a subterminal series in the interspaces; some black scales on termen. Hind wing white, with some brown irroration in and just beyond the cell.

Hab. NATAL, Charlestown (*Toppin*), 1 ♂, Durban (*Bowker*), 2 ♂ type. *Exp.* 40 mm.

Pydna brunneifascia, sp. n.

Fore wing with the areole short, vein 10 from beyond the areole; antennæ of male with the branches long.

♂. Head and thorax ochreous white tinged with brown in front, the palpi and frons dark brown; pectus and legs suffused with brown; abdomen ochreous white tinged with brown, especially on dorsum of second and third segments. Fore wing ochreous white slightly irrorated with brown; a dark reddish-brown fascia along median nervure from near base to near termen below vein 5, narrowing to points at extremities; faint traces of a fascia formed of diffused brown scales below costal area from middle of cell to below apex; a series of brown points just before termen. Hind wing silky white; the underside with the costal area tinged with brown.

Hab. UPPER CONGO (*Wollaston*), 1 ♂ type. *Exp.* 32 mm.

Pydna minima, sp. n.

Fore wing with the areole short, vein 10 from beyond the areole; antennæ of male with long branches.

♂. Head and front of thorax dark brown; antennæ fulvous, the rest of thorax white; pectus in front and legs on inner side dark brown; abdomen pale orange-yellow, the base white, the ventral surface white tinged with brown. Fore wing white rather sparsely irrorated with brown. Hind wing silky white. Underside silky white, the costal area of fore wing faintly tinged with rufous.

Hab. N. NIGERIA, Lokoja (*Dudgeon*), 1 ♂ type. *Exp.* 24 mm.

Pydna rubrifascia, sp. n.

Fore wing with the areole long, vein 10 from beyond the

arcole; antennæ of male with long branches, of female ciliated.

Head and tegulæ rufous; thorax yellow; legs rufous in front; abdomen ochreous yellow. Fore wing pale yellow; a chestnut-red fascia from base below median nervure, expanding into lower extremity of cell, then rather oblique to vein 6 near termen, its lower edge somewhat dentate at the veins; some rufous scales on discocellulars; slight rufous subterminal spots above veins 3 and 2 and a series of points just before termen. Hind wing yellow faintly tinged with rufous; the underside yellowish white, the costal area tinged with rufous.

Hab. MASHONALAND, Salisbury (*Marshall*), 1 ♂, Umtali (*Marshall*), 1 ♂; GAZALAND, Mt. Chirinda (*Marshall*), 1 ♀ type. *Exp.*, ♂ 32, ♀ 36 mm.

Closely allied to *P. nana*, Swinh., from India.

Pydna rhabdophora, sp. n.

Fore wing with the arcole long, vein 10 from the arcole; antennæ of male with the branches long.

♂. Head and thorax ochreous white tinged with brown; antennæ fulvous; frons blackish below; fore femora brown above; abdomen pale orange slightly banded with brown, the ventral surface yellowish white, lateral and sublateral series of small black spots. Fore wing ochreous white thickly irrorated with brown; a black-brown fascia along median nervure from near base to well beyond the cell, its lower edge somewhat dentate at veins 2 and 3. Hind wing white faintly tinged with ochreous; the underside white, with the costal area slightly tinged with ochreous.

Hab. N. NIGERIA, Lokoja, Mt. Patti (*Christy*), 1 ♂ type. *Exp.* 40 mm.

Pydna diatrecta, sp. n.

Fore wing with the arcole long, vein 10 from the arcole; antennæ of male with long branches.

♂. Head and thorax greyish ochreous tinged with brown, the head with black scales mixed; antennæ fulvous; pectus in front and fore tibiæ and tarsi on inner side blackish; abdomen greyish ochreous dorsally suffused with brown. Fore wing greyish ochreous thickly irrorated with black; a slight blackish fascia on median nervure from before middle, beyond the cell obliquely bent upwards to below apex, stronger and somewhat maculate; obliquely placed subterminal small black spots above veins 3 and 2; a series of black

points just before termen. Hind wing greyish suffused with fuscous brown leaving the termen pale; the underside whitish tinged with brown.

Hab. UGANDA, Masevi (*Christy*), 1 ♂ type, Kampala (*Christy*), 1 ♂. *Exp.* 36 mm.

Turnaca rufisquamata, sp. n.

♂. Head and thorax ochreous white mixed with rufous, the branches of antennæ blackish; palpi brown at side and tips; abdomen ochreous white tinged with rufous dorsally at base. Fore wing ochreous irrorated with hairy rufous scales especially on inner margin; veins 6 and 4 with slight dark streaks to the postmedial series of minute dark streaks on the veins; the extremities of the veins with slight dark streaks. Hind wing yellowish white.

Hab. GOLD COAST, Kumasi (*Whiteside*), 1 ♂ type. *Exp.* 42 mm.

Allied to *T. grisea*, Holl.

Catarctia terminipuncta, sp. n.

Fore wing with the termen strongly excised below apex; hind wing with the costa strongly excised before apex.

♂. Head and thorax ochreous white tinged with rufous; palpi blackish at sides; antennæ rufous; dorsum of thorax with black streak; fore legs pinkish on inner side; abdomen yellow, with subdorsal series of black spots, the hair at base and extremity pink. Fore wing ochreous white suffused with pale rufous; a small black spot in cell near base; a small pink discoidal spot; faint traces of a curved antemedial line and of a postmedial line bent outwards below costa, angled outwards at veins 4, 3, then incurved; an indistinct whitish subterminal line, angled outwards at veins 7, 6, 4, 3, incurved at discal fold and below vein 3 and ending at tornus, the area beyond it somewhat deeper rufous; a terminal series of black spots slightly defined by whitish. Hind wing pale yellow, the costal area tinged with rufous, a patch of pink suffusion on terminal area below vein 2 narrowing to tornus; a slight pinkish discoidal point; an indistinct curved pinkish postmedial line from costa to discal fold; traces of a sinuous whitish subterminal line from costa to termen at vein 2, the area beyond it tinged with rufous; two slight black points on termen below apex; cilia tinged with pink at apex. Underside of fore wing whitish, the costal area suffused with pink to beyond middle, a triangular patch of rufous suffusion before termen from

costa to vein 3, with two whitish lunules on it below the costa; hind wing whitish, the costal area suffused with rufous and with fuscous before and beyond the subterminal line, a small blackish discoidal spot.

Hab. GOLD COAST, Ashanti, Obuassi (*Bergman*), 1 ♂ type.
Exp. 48 mm.

Genus *TRICHOLOBA*, nov.

Type *T. (Antheua) carteri*, Druce.

Proboscis aborted, small; palpi upturned, slender, reaching about to vertex of head; frons smooth, with large tuft of hair above; eyes large, round; antennæ in both sexes bipectinate with long branches, the apical part laminate; thorax clothed with rough hair only and without crests; fore tibiæ moderately fringed with hair, the mid and hind tibiæ fringed with long hair; abdomen without crests. Fore wing with the apex rectangular, the termen obliquely curved and not crenulate; vein 3 from just before angle of cell; 5 from above middle of discocellulars; 9 from 10 anastomosing with 8 to form a long areole, 6 from middle of areole, 8 from beyond it; 11 from cell. Hind wing with very large lobe on costa near base fringed with thick long hair on its outer edge extending to towards apex; veins 3, 4 from angle of cell; 5 from middle of discocellulars; 6, 7 shortly stalked; 8 approximated to the cell to towards extremity.

Tricholoba airiclathrata, sp. n.

♀. Head and thorax pale ochreous yellow mixed with some reddish brown; palpi dark brown behind; fore legs suffused with brown in front, the tarsi banded with brown; abdomen pale yellow, with some reddish brown at base of dorsum. Fore wing creamy white irrorated with chocolate-brown; a subbasal chocolate-brown point below costa, with an oblique elliptical patch below it extending to below the cell and rather broken up by some of the ground-colour; two antemedial points below the costa, with traces of a double waved line from them to inner margin; a small elliptical chocolate annulus in end of cell intersected by a streak of the ground-colour in discal fold; a large elliptical chocolate patch at lower angle of cell, hooked on discocellulars and broken up by pale streaks on the veins; traces of a double postmedial line, the lines widely separated and oblique to vein 4, then inwardly oblique and more approximated; a conical patch of chocolate marks much broken up by the

ground-colour on costa towards apex and some chocolate on apical part of costa; subterminal line represented by a double lunule between veins 5, 4 and double oblique waved line from vein 3 to inner margin with some chocolate between it and postmedial line between veins 3 and 2; the termen thickly irrorated with chocolate towards tornus. Hind wing pale yellow, the costal edge brownish towards apex; the underside with the lobe fringed with chocolate-brown hair.

Hab. SIERRA LEONE (*Dudgeon*), 1 ♀ type. *Exp.* 50 mm.

Scalmicauda heterogyna, sp. n.

Antennæ of male bipectinate with moderate branches, the apical half simple; fore wing narrow.

♂. Head and tegulæ rufous deepening to chocolate behind, the vertex of head yellowish; the pointed crest behind the tegulæ very long; thorax and abdomen ochreous white, the pectus rufous in front. Fore wing pale fuscous brown, the inner area pale brownish grey, extending beyond the postmedial line to vein 3; traces of a slight pale subbasal line from costa to vein 1; a slight obliquely curved ante-medial brown line defined on outer side by whitish; orbicular and reniform with whitish annuli slightly defined by brown, elliptical, open above, the former rather oblique and with a round spot defined by brown below it in submedian interspace; postmedial line double, rufous filled in with whitish and defined by whitish on outer side, oblique and straight from costa just before apex to middle of inner margin; a sinuous brown subterminal line angled outwards at veins 4, 3, 2, and inwards at vein 1; cilia brown. Hind wing white, the inner area tinged with brown except towards base.

♀. Abdomen rufous; fore wing rufous, the inner half tinged with whitish; hind wing pale rufous.

Hab. DELAGOA BAY, 1 ♂ type; NATAL, Pinetown (*Bowker*), 1 ♀, Durban (*Clarke*), 1 ♀. *Exp.*, ♂ 34, ♀ 48-52 mm.

Allied to *S. spissicornis*, Mab., from Madagascar.

Scalmicauda flavipennis, sp. n.

Antennæ of male bipectinate with moderate branches, the apical half simple; fore wing narrow.

♂. Head, tegulæ, and a patch on prothorax bright rufous; palpi yellow tinged with rufous; thorax grey-brown, no crest behind tegulæ; abdomen whitish tinged with brown, the anal tuft long and tinged with rufous; pectus, legs, and

ventral surface of abdomen yellow slightly tinged with rufous. Fore wing pale yellow slightly irrorated with brown, the costa rufous except at base, the inner area suffused with rufous except at base; a fine sinuous brown subbasal line from costa to vein 1; antemedial line fine, brown, excurved below submedian fold; orbicular and reniform with fine brown annuli, large, elliptical, open above, a similar mark below the cell under the orbicular; postmedial line fine, brown, oblique from costa to vein 3, then still more oblique; a crenulate subterminal brown line, the area beyond it tinged with rufous; cilia rufous. Hind wing yellowish white, the hair on vein 1 faintly tinged with rufous.

Hab. SIERRA LEONE (*Bartlett*), 1 ♂ type. *Exp.* 50 mm.

Scalmicauda argentescens, sp. n.

Antennæ of male bipectinate with moderate branches, the apical half simple; fore wing narrow, the costa highly arched towards apex.

♂. Palpi and frons chocolate-brown, vertex of head white tinged with rufous; antennæ pale rufous; thorax red-brown tinged with grey; abdomen red-brown, paler towards extremity; pectus, legs, and ventral surface of abdomen ochreous, the pectus in front and fore legs rufous. Fore wing red-brown irrorated and suffused with silvery grey, the costal area paler towards base; a faint dark antemedial line from cell to inner margin, angled outwards below the cell, then oblique; orbicular and reniform faintly defined by blackish, closely approximated, the former oblique elliptical with white point on its inner edge, the latter elliptical and slightly constricted at middle with a small white spot between it and orbicular; postmedial line indistinct, dark, defined on outer side by silvery grey, very oblique and slightly incurved from apex to middle of inner margin; the costa towards apex bright rufous; a subterminal series of slight dark lunules in the interspaces, some silvery-grey suffusion before and beyond it at tornus; cilia dark brown. Hind wing pale red-brown; the underside ochreous white with a faint rufous tinge.

Hab. GOLD COAST, Kumasi (*Whiteside*), 1 ♂ type. *Exp.* 52 mm.

Scalmicauda niveiplaga, sp. n.

♀. Head, tegulæ, and a patch on prothorax deep chocolate-red, the rest of thorax rufous; pectus, legs, and abdomen ochreous tinged with rufous, the last dorsally

suffused with brown except at extremity. Fore wing rufous slightly irrorated with brown; subbasal line slight, brown, oblique from costa to median nervure and ending at vein 1; antemedial line brown, slightly angled inwards at submedian fold, then excurved; orbicular and reniform defined by brown, their centres also defined by brown, elliptical, the latter somewhat constricted at middle on inner side, a round blackish spot with pale point in centre below the orbicular; postmedial line brown slightly defined on inner side by greyish, slightly angled outwards below costa, obliquely curved to vein 2, then bent inwards and very oblique to inner margin, an elongate wedge-shaped silvery-white patch beyond it on costa; subterminal line represented by a series of slight dark lunules in the interspace, the lunule below vein 2 displaced inwards to near postmedial line; cilia chocolate brown. Hind wing pale red-brown, the costal area greyish; cilia whitish at tips; the underside ochreous white.

Hab. S. NIGERIA, Old Calabar (*Crompton*), 1 ♀ type.
Exp. 60 mm.

Resembles *S. argenteo-maculata*, Auriv.

Scalmicauda griseitincta, sp. n.

Antennæ of male bipectinate with long branches to near apex which is simple, of female with shorter branches; fore wing narrow, the apex rounded.

♂. Head and thorax dark brown mixed with ochreous white; antennæ with the shaft barred with white towards base; tegulæ with slight dark medial line; fore tibiæ with the process on inner side large and pure white; tarsi banded with white; abdomen brown with a cupreous gloss, the anal tuft long. Fore wing red-brown glossed with grey, the veins with slight dark streaks, the submedian fold with series of minute red-brown streaks; a black point in cell near base; subbasal line red-brown, minutely waved, from costa to vein 1, the costal area and cell beyond it suffused with red-brown; medial line double, bent outwards in cell, then oblique, sinuous and angled inwards on vein 1; a dark discoidal striga with white points at the angles of cell; postmedial line double, the lines widely separated, obliquely curved and minutely dentate, the outer line with dark points beyond it on the veins, some white points beyond it on costa; subterminal line brown, minutely waved and somewhat excurved at middle; a fine dark terminal line and series of white points at base of cilia. Hind wing grey-brown with a reddish tinge, the cilia white at tips; the underside with faint patch

of dark suffusion on costal area near base and indistinct diffused sinuous postmedial line.

♀. Hind wing fuscous brown.

Hab. NATAL, Durban (*Leigh*), 1 ♂, 1 ♀ type. *Exp.*, ♂ 32, ♀ 38 mm.

Larva. Brown, the warts minute, blackish; head blackish; a pair of anal processes.

Scalmicauda xanthogyna, sp. n.

Antennæ of male serrate and fasciculate, the apex simple, of female minutely serrate; fore wing rather short and broad.

♂. Head and thorax deep chocolate-red, the vertex of head more yellow; palpi yellow in front; antennæ rufous; pectus and legs ochreous tinged with rufous; abdomen reddish brown with pale segmental bands, the ventral surface yellow. Fore wing deep chocolate-red; traces of an oblique sinuous antemedial line; orbicular and reniform faintly defined by brown, the former small, round, the latter elliptical with its outer edge indented, a small annulus defined by brown below the orbicular in submedian interspace; a blackish point above base of vein 6; postmedial line indistinct, dark, from costa towards apex, excurved below costa, then oblique and crenulate to middle of inner margin, a slight grey-brown patch beyond it on costa; a subterminal series of slight black lunules in the interspaces, the lunule below vein 3 with another lunule before it, and two pairs of points below vein 2; slight dark marks on termen below veins 4 and 3. Hind wing pale red-brown, whitish at base; the cilia whitish at tips; the underside whitish tinged with rufous.

♀. Head and tegulæ yellow; thorax yellowish brown; abdomen yellow tinged with red-brown; fore wing king's yellow, the inner half except at base suffused with red-brown, all the markings rather more diffused.

Hab. S. NIGERIA, Sapele (*Sampson*), 1 ♂, 1 ♀ type. *Exp.*, ♂ 42, ♀ 44 mm.

Scalmicauda albicostata, sp. n.

♀. Head and thorax deep maroon-red; pectus and abdomen whitish tinged with rufous, the pectus in front, legs, and hair at base of dorsum of abdomen red. Fore wing deep maroon-red, the costal edge pure white; a faint whitish antemedial line, oblique from costa to vein 1, then bent inwards to inner margin; postmedial line whitish, very oblique,

slightly excurved from costa to vein 2, then slightly incurved. Hind wing glossy white, the veins tinged with ochreous.

Hab. MASHONALAND, Salisbury (*Marshall*), 1 ♀ type.
Exp. 50 mm.

Scalmicauda ectoleuca, sp. n.

Antennæ of male serrate and fasciculate, the apex simple ; fore wing short and broad, the tornus with a scale-tooth.

♂. Head and thorax deep chocolate-red, the frons, vertex of thorax, and outer edge of patagia with some yellow ; pectus and legs yellow tinged with rufous ; abdomen dark brown, the extremity and ventral surface yellow. Fore wing with the base and costal half to postmedial line yellow, the costal edge chocolate-red except at base, some red irroration before antemedial line on inner area and before postmedial line, the area below the cell deep chocolate-red from the antemedial line to tornus and a red patch beyond the postmedial line above and below vein 5, the rest of terminal area creamy white with some red irroration ; oblique sinuous chocolate-red subbasal and antemedial lines, the latter indistinctly double ; orbicular and reniform defined by chocolate-red, the former round, the latter filled in with red suffusion and angled inwards on median nervure ; traces of a dark annulus below the orbicular in submedian interspace ; postmedial line chocolate-red, oblique from costa towards apex to vein 2, then incurved ; a double lunulate black subterminal line. Hind wing dark brown ; the underside whitish tinged with brown especially on costal area.

Hab. S. NIGERIA, Old Calabar (*Sampson*), 1 ♂ type.
Exp. 32 mm.

Scalmicauda rufula, sp. n.

Antennæ of male with minute fascicles of cilia ; fore wing narrow.

♂. Head and thorax rufous mixed with greyish ; palpi chocolate-brown at sides ; antennæ with the basal joint white at tip ; hind tarsi slightly ringed with white ; abdomen rufous, the anal tuft very long. Fore wing rufous mixed with greyish, the terminal area somewhat paler ; a whitish point at base of median nervure ; subbasal line fine, double filled in with whitish, slightly incurved ; antemedial line fine, double filled in with whitish, sinuous ; orbicular elliptical, with whitish annulus slightly defined by brown, extending to just below costa, and with fine sinuous double line filled in with whitish from it to inner margin ; reniform elliptical with

whitish annulus and whitish line at middle, a blackish point at its lower inner extremity and a small black spot before it below the cell; medial line fine, double filled in with whitish, from below the costa well beyond the cell, oblique, slightly waved between veins 3 and 1; two similar postmedial lines; a subterminal series of oblique whitish striæ defined on outer side by black in the interspaces, placed in echelon; a fine dark terminal line. Hind wing rufous, the cilia white at tips; the underside whitish suffused with rufous, traces of a whitish postmedial band, rufous subterminal line, and series of rufous striæ before termen.

Hab. S. NIGERIA, Old Calabar (*Crompton*), 1 ♂ type. *Exp.* 38 mm.

Ichthyura lentisignata, sp. n.

♂. Head, dorsum of tegulæ, and a patch on prothorax black-brown, the rest of thorax and abdomen reddish brown mixed with greyish; antennæ grey-brown; pectus black-brown in front. Fore wing grey-brown tinged with red-brown, especially on apical area, and thickly irrorated with black; a black point in cell near base; two slight oblique antemedial lines, the first defined on outer side by whitish and bent outwards at median nervure, the second defined on inner side by whitish and slightly excurved below costa; a slight ochreous discoidal striga with faint dark shade beyond it and oblique ochreous line from lower angle of cell to inner margin with dark shade on its outer edge; a slight pale oblique postmedial line from costa to just below vein 2, somewhat excurved at vein 6 and incurved at discal fold, an oblique dark shade from it at discal fold to termen at vein 3; a subterminal series of slight dark points, somewhat excurved below vein 7 and at middle and bent outwards to termen above tornus; a terminal series of slight black striæ. Hind wing white slightly irrorated with red-brown, the veins and inner area tinged with red-brown; a slight red-brown terminal line; the underside white with the costal area irrorated with brown.

Hab. NATAL, Durban (*Leigh*), 1 ♂ type. *Exp.* 32 mm.

Allied to *S. restituta*, Wlk., from India.

Ichthyura albifasciata, sp. n.

♀. Head and thorax white with a few dark hairs, the dorsum of thorax tinged with rufous; abdomen white slightly tinged with brown; palpi pale rufous. Fore wing pale rufous; a wedge-shaped white fascia above and below median nervure from near base to end of cell towards which it

widens, a white patch slightly irrorated with brown between veins 4, 3, another between extremities of veins 7, 6, and some white irrorated with brown on costa towards apex; vein 7, the median nervure, and veins arising from it and extremities of veins 6, 7 streaked with white. Hind wing white.

Hab. SIERRA LEONE (*Morgan*), 1 ♀ type. *Exp.* 34 mm.

Bombycidæ.

Trilocha obliquisigna, sp. n.

Fore wing with the termen evenly curved.

♂. Head, thorax, and abdomen pale yellow slightly mixed with red-brown; palpi and sides of frons red-brown; legs red-brown in front. Fore wing pale yellow sparsely irrorated with red-brown, a brownish patch on termen below apex; the antemedial area with two slight red-brown marks on costa and three very indistinct curved waved lines; an obliquely curved blackish discoidal striga; an oblique postmedial red-brown bar from costa; two red-brown subterminal lines, the first indistinct and slightly waved, the second more distinct and waved, forming a small spot at costa; a rather elongate red-brown apical mark; cilia reddish brown. Hind wing pale yellow slightly irrorated with red-brown, the inner margin with three red-brown spots; the antemedial area with three very indistinct waved lines; a slight discoidal point; two curved, waved postmedial lines, not reaching costa and closely approximated towards inner margin; a diffused subterminal red-brown shade from vein 4 to inner margin; cilia red-brown; the underside with two discoidal points, the two postmedial lines more distinct and reaching the costa.

Hab. N. ANGOLA, Kibokolo do Zombo (*Lewis*), 1 ♂ type. *Exp.* 30 mm.

Resembles *T. albiceps*, Wlk., from Borneo.

[To be continued.]

LXVII.—*Descriptions and Records of Bees.*—XXIX.

By T. D. A. COCKERELL, University of Colorado.

Lithurgus chrysurus, Fonsc.

S.W. Persia (*Escalera*). British Museum.

One female, which has the ventral scopa shining creamy white, reddish in the middle. In all respects this Persian

insect seems practically identical with the Sicilian var. *siculus*, Perez, but I have not had an opportunity of seeing Sicilian examples.

Anthidium florentinum (Fabr.).

Cyprus (*Miss Bates*), 1 ♂. British Museum.

The specimen is larger than usual, and the seventh abdominal segment is entirely black. It is possible that there is a distinct Cyprian race.

Megachile gulheccensis, sp. n.

♀.—Length 20 mm. ; expanse about 33.

Shape as in the group of *M. rufiventris*, *M. mystacea*, &c., the rather long abdomen broadest about the junction of the second and third segments ; head and thorax black, dorsally with short inconspicuous black hair ; face with black hair, a little slightly pallid on each side ; cheeks below with black hair ; prothorax and sides of metathorax with long yellowish-white hair ; pleura with black hair ; head very large, broader than thorax ; clypeus short and broad, densely punctured, toward the sides the punctures mixed very large and very small, the lower margin straight or faintly concave, emitting some long dark reddish hairs, and bounded on each side by a prominent tubercular angle ; mandibles with a very broad cutting-edge, only an apical and subapical tooth well-defined ; region midway between the antennæ elevated and reddish ; antennæ wholly dark, first three joints of flagellum nearly equal ; vertex very broad, with strong and close but well-separated punctures on a shining ground ; cheeks broad, less densely punctured ; mesothorax densely and strongly punctured ; scutellum dull, rugoso-punctate ; area of metathorax depressed centrally ; tegulæ ferruginous, with minute punctures. Wings strongly infuscated, coloured somewhat as in *Chalicodoma sicula* ; b. n. falling just short of t.-m. ; apical part of marginal cell rather slender. Legs reddish black, with dark hair, the tibiæ behind largely chestnut-red, the hair on tarsi becoming reddish, that on inner side of hind tarsi bright ferruginous ; claws simple. Abdomen dark reddish, the first segment with a very broad well-defined basin ; dorsal surface of abdomen densely covered with short felt-like pale ochreous hair, on apical segment becoming ferruginous ; ventral scopa entirely bright ferruginous. Maxillary palpi with long hair ; blade of maxilla conspicuously but finely transversely ribbed ; second joint of labial palpi a little longer than first ; middle femora very broad.

Hab. Gulhek, Persia, July 1906 (*E. Grant-Duff*). British Museum.

The clypeus shows no sign of the median tubercle found in several of the large Asiatic species. This fine species is evidently very close to *M. foersteri*, Gerst., originally described from Crete. I believe that it is identical with the insect from Asia Minor described by Friese as *M. foersteri albescens*. As the name *albescens* was preoccupied, W. A. Schulz (1906) proposed to substitute *leucotricha*. The name *leucotricha*, however, was earlier used (Cockerell, 1902) for the representative or subspecies of *M. occidentalis* found in Southern California. The whitish colour of the abdomen in *M. gulhecensis* is especially evident when seen from in front.

Megachile fülleborni, Friese.

Near Johannesburg, Transvaal (*A. J. Chalmley*). British Museum.

The specimen exactly agrees with one from Langenburg, L. Nyassa (*Fülleborn*).

Prosopis husela, sp. n.

Similar to *P. elegans*, Smith, but anterior border of scutellum black and mesothorax with two discal longitudinal yellow bands in addition to the marginal ones; first r.n. meeting first t.-c.

♀.—Length a little over 8 mm.

Abdomen ferruginous, not blackened as in ♀ *elegans*; pleura, behind the tubercles, with a very large yellow patch.

♂.—Length about 7 mm.

Pleura with a small yellow patch behind the tubercles.

Hab. Townsville, Queensland; two males, 27. 2. 03 (*F. P. Dodd*); in British Museum: one female, 7. 1. 03 (*F. P. Dodd*). All from the Turner collection.

Husela is a Malay word for eleven, in allusion to the bars on the mesothorax.

Prosopis elegans huseloides, subsp. n.

♀.—Similar to *P. elegans*, but smaller (length about 8 mm.); first three abdominal segments ferruginous, more or less marked with black on disk, the others black; sides of clypeus without black stripes, but with ferruginous; mesothorax with a transverse yellow band (not reaching sides) along posterior margin; scutellum (as in *elegans*, but not as in *husela*) all yellow; no yellow patch behind tubercles, but

one or two small, evanescent, yellow spots more posteriorly ; first r. n. meeting first t.-c.

Hab. Townsville, Queensland ; two females, 10. 1. 03 (*F. P. Dodd*). British Museum. From the Turner collection.

It is obvious that *elegans*, *huseloides*, and *husela* are very closely related ; perhaps they are all forms of one species, but I treat *husela* as specifically distinct because it has a very striking appearance, and among the rather numerous *P. elegans* I have seen there has been nothing at all like it.

Palæorhiza melanura, sp. n.

♀.—Length 9 mm.

Head and thorax light rather dull yellow, marked with black ; abdomen light reddish testaceous or honey-colour, entirely black, with black hair, beyond the third segment ; head long, face narrow, malar space large ; front densely punctured, sides of vertex shining and sparsely punctured ; facial foveæ represented by grooves near the eye on vertex ; vertex black, and a broad black stripe extending downward to each antenna, leaving between a narrower yellow stripe ascending to middle ocellus ; mouth-parts and hinder part of cheeks honey-colour ; clypeus with two broad dark brown bars, the margins of which are suffused ; other parts of clypeus reddish, and adjacent sides of face whitish ; antennæ dark brownish or reddish beneath ; mesothorax strongly and closely punctured, black, with four longitudinal yellow bars, the outer one marginal, none quite reaching the anterior margin ; scutellum with a broad black band, and on each side (largely axillar) a transverse black mark ; postscutellum all yellow ; area of metathorax large, strongly but finely and regularly longitudinally grooved or fluted, bounded on each side by a black punctured band. Legs rufo-testaceous ; tegulæ pale testaceous. Wings large, minutely hairy, very pale yellowish, dusky at apex ; stigma and nervures pale ferruginous, darker towards the base ; second s.m. receiving both recurrent nervures ; first abdominal segment with a transverse dark band, the middle third of which is wanting ; hind spur with about four strong teeth.

♂.—Similar, but the face narrower, and the very long and narrow clypeus without dark bands ; apex of abdomen truncate, more or less emarginate in the middle.

Maxillary comb very well developed, with large teeth, the lowermost (most basad) of which are longest (the end one at least 190 μ) and curved ; blade of maxilla short (about 545 μ beyond the origin of palpus), broad, very obtuse, with many

apical bristles; hyaline area well developed, about $85\ \mu$ broad in middle; maxillary palpi 6-jointed, the joints sub-equal, measuring in μ : (1) 187, (2) 187, (3) 204, (4) 204, (5) 204, (6) 221, the last two slender; tongue about $748\ \mu$ long, dagger-shaped, slender, the apical part linear, but appearing broad because of the very abundant long branched hairs; paraglossæ small, oval, very hairy; labial palpi 4-jointed, the first two joints stout, the third medium, the fourth slender; joints in μ : (1) 170, (2) 136, (3) 136, (4) 136.

Hab. Cairns, Queensland (*Turner*). Females labelled Kur. 1. 02; 2. 02; 3. 02: males Kur. 12. 01; 1. 02; 4. 02. Kur. is presumably Kuranda.

Palæorhiza flavomellea, sp. n.

♀.—Length about 7 mm.

Looking like a small *P. melanura*, with the same colour and pattern, but the area of metathorax shining, not fluted; the clypeus without dark bars (sometimes a ferruginous spot at each upper corner); the median black band of scutellum continued on postscutellum, and projected as a ferruginous mark (pointed at end) on metathorax.

♂.—Similar; length about $6\frac{1}{2}$ mm.; face strongly constricted below.

The mouth-parts of this species show the following characters:—

Structure as in *P. melanura*; tongue very broad at base, rapidly narrowing to the linear apical part, with the usual long hair; on each side is a separable tuft of hairs arising from near the base. Hairs at end of maxillary blade strongly plumose (in *melanura* they are quite simple).

Tongue $375\ \mu$ long; palpal joints measuring in μ : maxillary palpi (1) 85, (2) 153, (3) 153, (4) 153, (5) 170, (6) 204; labial palpi (1) 102, (2) 85, (3) 102, (4) 110. A curious comb of short erect bristles runs along inner side of first two joints of maxillary palpi, and is not interrupted at the suture. The same comb is found in *P. melanura*.

Hab. Cairns, Queensland (*Turner*), 4 ♀, 2 ♂. The males are labelled Kur. 12. 01: the females Kur. 12. 01; 3. 02; 5. 02. British Museum.

Palæorhiza basilura, sp. n.

♀.—Length about 8 mm.

Looking like a rather small *P. melanura*, with the same colour and pattern, except as follows:—The shorter and

broader clypeus has a broad ferruginous band on each side, each equal to the median yellow band, but not quite reaching the lower margin; a longitudinal ferruginous band, becoming black in front, runs across the pleura; the stigma is dark rufo-fuscous, and the nervures are dilute fuscous; the first abdominal segment has no dark marks; the bases of the segments are yellow, especially at sides; the fourth segment is deep purple instead of black, and is yellow at the base, the yellow narrowing to a point medially; the apical segments are dark shining blue. The postscutellum has no black mark, and the area of metathorax is shining, ferruginous at sides, wholly without fluting. The scape is light ferruginous in front.

Hab. Cairns, Queensland (*Turner*), 1 ♀. Kur. 12. 01. British Museum.

CÆLIOXYS.

The three Australian species have been described only in the female. I have before me males of all three, from the *Turner* collection, now in the British Museum. They may be separated as follows:—

- Length slightly over 12 mm.: wings brilliantly purple, hyaline at base; some tufts of black hair at sides of thorax behind, and lower down a tuft of white hair; apical segment of abdomen with four terminal teeth, the two upper ones scarcely more than rectangular, and with a small tooth at each side basally; fourth ventral segment with two strong keels, and deeply excavated between them. (*Cairns*; Kur. 4. 02.) *albiceps*, Friese.
- Smaller, length not over 9 mm.: wings infuscated, not very dark, not purple; no tufts of black hair at sides of thorax behind 1.
1. Scutellum with dense very large punctures; apical segment of abdomen broader than long, with six long teeth, the lateral ones finger-like but very slender. (*Mackay*, 1. 01.) *reginæ*, Ckll.
- Middle of scutellum smooth and shining; apical segment of abdomen longer than broad, with six well-developed teeth, the lateral ones spine-like. (*Mackay*, 9. 00.) *albolineata*, Ckll.

C. albolineata also occurs at Cairns (Kur. 4. 02: *Turner*).

Nomia aurantifer, sp. n.

♀.—Length about 12 mm.

Black, the abdomen without hair-bands, but with the hind margins of segments 2 to 4 broadly smooth and shining and

of the most brilliant orange; no tooth or process on post-scutellum or metathorax. Head and thorax dull, minutely roughened, with scattered punctures; face broad, with a slight raised line from middle ocellus to apex of clypeus, the middle of which, a little below level of antennæ, passes through a shining elevation; clypeus strongly punctured; mandibles bidentate; tongue linear, of moderate length; hair of head mainly whitish, inconspicuous, of pleura and sides of metathorax the same, but black on mesothorax and scutellum; area of metathorax bow-shaped, with a double curve on each side, the apex (middle) angulate, the concave basin with delicate ridges; some pallid tomentum between mesothorax and scutellum. Legs black, with mainly dark hair; tubercles with a conspicuous fringe of light hair; tegulæ moderately large, black. Wings strongly infuscated, nervures fuscous, stigma rather small, reddish in middle; second s.m. very small, receiving r. n. at beginning of its last third; hair of abdomen scanty, mainly dark, pale reddish at sides of first segment, and a dense pale reddish apical fringe on fifth; a little light colour on apical margin of first segment, at extreme sides; ventral segments fringed with long pale reddish hair.

Hab. Cairns, Queensland (*Turner*). "Kur. 4. 02," 2 ♀. British Museum.

A magnificent species, related to *N. cincta*, Smith, from Key Island. *N. cincta*, var. *tomentifera*, Friese, recorded from Cairns, cannot be this insect, as it is smaller, and has yellow-brown tegulæ and brown-yellow legs. The thorax also differs entirely in the pubescence.

Nomia darwinorum, sp. n.

♂.—Length about $10\frac{1}{2}$ mm.

Very close to *N. pulchribalteata*, Cam. (cotype from New Britain compared), differing thus:—Somewhat larger; hair of face very dense, greyish white. Wings clearer, not so brown, the outer margin broadly dusky. Hind femora more swollen; hind tibiæ and tarsi without red; abdominal bands considerably broader, apple-green (very yellow-green) shot with vermilion; fourth ventral segment with a very distinct fringe of white hair. As in *N. pulchribalteata*, the scutellum is bituberculate, and the postscutellum has a pair of long teeth, which arise from a mass of white tomentum. From *N. pulchribalteata austrovagans*, Ckll., this is known by the colour of the abdominal bands and hind legs.

Hab. Port Darwin, Australia, 12. 02 (*Turner*). British Museum.

Nomia iridescens, Smith.

Singapore (*H. N. Ridley*). British Museum.

The abdominal bands are brilliant blue-green, shot with purple; the first five segments are banded in the male. The thorax above has a good deal of fuscous hair in both sexes; this is not indicated in Bingham's description (*Hymenop. Brit. India*), but there is no doubt about the identity of my insect, as I possess a cotype from F. Smith's collection. The tegulæ are pointed or caudate posteriorly.

Nomia iridescens, var. *ridleyi*, nov.

♂.—Structure exactly as in *N. iridescens*, but the five abdominal bands yellow-green shot with orange-vermilion; second s.m. much higher than broad.

Hab. Singapore (*H. N. Ridley*). British Museum.

Nomia (Crocisaspidia) muscatensis, sp. n.

♀.—Length about $11\frac{1}{2}$ mm.; expanse about 18.

With the typical *Crocisaspidia* scutellum and postscutellum; head and thorax densely and minutely punctured, the usual pubescence creamy white, on mesothorax more ochreous; eyes strongly converging below; clypeus not carinate; tongue linear; head black; mandibles ferruginous, black at tips; antennæ entirely bright ferruginous; mesothorax and most of pleura black, rest of thorax clear ferruginous; area of metathorax broadly triangular, dullish, minutely beaded along the base. Legs clear ferruginous; tegulæ ferruginous, moderately large. Wings dusky, rather reddish, stigma and nervures ferruginous; stigma small; second s.m. square, receiving first r. n. near its end; abdomen ferruginous, the first four segments with very broad ivory-coloured tegumentary bands, the ferruginous parts rather closely punctured; venter with shining pale yellow hair.

Hab. Muscat, Arabia (*A. S. G. Jayakar*, no. 27). British Museum.

Nearest to *N. (Crocisaspidia) forbesii* (W. F. Kirby) from Socotra, and *N. lamellata*, Smith, from Egypt, but distinguished by the prevailing red coloration.

Nomia (Crocisaspidia) lamellata, Smith, 1875.

The type male, from Egypt, was examined and found to have the *Crocisaspidia* scutellum and postscutellum.

Abdomen with broad entire ivory-white bands, the first a little greenish. Legs red, pointed process on hind tibiæ enormous.

The type female, labelled as from the Gaboon (Smith's description says Gambia), seems to be the same species, but is perhaps distinct, as the abdomen (excluding bands) is densely rugoso-punctate in male and smooth with separated punctures in female. In both the scutellar lobes are ferruginous.

The female should be regarded as the true type, being first described.

Nomia (Crocisaspidia) crocisæformis, Bingham, 1903.

The type male, from Abyssinia, was examined, and found to be a genuine *Crocisaspidia* in every respect. Length about 14 mm., expanse 25. Face covered with white hair. Anterior wings dark fuscous; second s.m. square, less than half length of third, first r.n. joining it near apex. Tongue elongate; flagellum dull ferruginous beneath; mesothorax dull, with dense small punctures, scutellum the same; anterior and middle tibiæ and tarsi clothed with white hair on outer side; hind tibiæ of the triangular type, the apical projection ferruginous; abdomen with large lateral quadrate white spots, faintly tinged with green; hind femora swollen.

Walker wrote (1871) of *N. vespoïdes*, Walker, and *N. zonaria*, Walker, from the Red Sea, that "the thin forked edge which forms the hind border of the scutellum" distinguishes them from other *Nomiæ*. I infer from this that they belong to *Crocisaspidia*. *N. zonaria* is perhaps the same as *N. lamellata* (Egyptian form).

Camptopæum persicum, sp. n.

♂.—Length a little over 6 mm.

Black and very pale yellow; head and thorax with abundant very pale yellowish hair; head black, with mandibles (except tips), labrum, clypeus, large supraclypeal mark (obtusely rounded above between antennæ), dog-ear marks (almost wholly above level of clypeus), and lateral marks (ending above rather obtusely at about level of middle of scape) all very pale yellow; scape pale yellow in front; flagellum reddish brown above, orange beneath, the second and third joints partly ringed with brown beneath; eyes very broad; thorax black, with the following parts very light yellow, upper border of prothorax, tubercles, scutellum (or the yellow reduced to a pair of transversely oblong spots), postscutellum, and sometimes a pair of short oblique bands

along sides of area of metathorax ; there may also be a light triangular mark on each side of metathorax, nearly hidden by hair; area of metathorax irregularly longitudinally wrinkled. Legs very light yellow, anterior femora with nearly the basal two-thirds dark behind, and small dark marks at bases of the other femora ; claws bifid ; tegulæ pellucid, with a light yellow spot. Wings hyaline, a little dusky, stigma and nervures pale brown ; stigma small ; marginal cell rather obtusely pointed than truncate ; second s.m. about as long as first, receiving first r. n. a considerable distance from base. All the abdominal segments with very broad pale yellow bands, nearly covering the surface ; basad of the bands the segments are black, but the apical margins are subtranslucent testaceous ; apical plate ferruginous, subtruncate, with rounded edges ; venter pale yellow.

Hab. S.W. Persia (*Escalera*) ; 2 ♂. British Museum.

Apparently nearest to *C. handlirschi*, Friese, from Algeria, but easily separated by the colour of the metathorax.

Bombus longiceps, Smith.

A worker from Baltistan agrees with Smith's description. It is a very pretty insect, the thoracic hair bright canary-yellow and that at the end of the abdomen very bright red. Friese and Wagner (1909) make this a variety of *B. hortorum*, but remark that they have no specimens. The malar space in the specimen before me is only about as broad as long, suggesting a doubt whether it is genuine *longiceps* (it certainly is distinct from *hortorum*) ; but since the striking coloration agrees with Smith's account, and I do not know whether "head elongate" is to be interpreted as meaning excessively so, I cannot venture to regard it as a new species.

Thrinchostoma lemuriæ, sp. n.

♂.—Length about 15 mm. ; thorax and abdomen about 12 ; anterior wing not quite 11.

General structure as in *T. renitantly*, Saussure, but considerably larger, with very dusky (brownish-grey) wings. Head and thorax black, the abundant hair dull fulvous ; eyes very prominent ; clypeus greatly produced, as usual, with its apical margin broadly pallid, testaceous shading into rufous ; antennæ black, the flagellum obscurely dull ferruginous beneath ; outer side of flagellum with very numerous conspicuous elongate pits ; mesothorax closely punctured ; area of metathorax closely longitudinally wrinkled, the rugæ

connected by very numerous cross ones; tegulæ ferruginous. Wings hairy, nervures and the large stigma fusco-ferruginous; b. n. falling short of t.-m.; second t.-c. with the usual patch of black hair, but the nervure only slightly bent (not strongly as in *T. bicometes*). Legs ferruginous; hind tibia with a broad creamy-white lamina bearing the spurs; hind tarsi very long, dull pale yellowish, with yellowish hair. Abdomen black, with the usual apical hair-bands, only evident in certain lights, when they shine brilliantly; disks of third and fourth segments covered with a sort of brownish felt; fifth ventral segment with a pencil of long yellowish hair on each side, and a pair of small erect hair-pencils arising from base, in the wide emargination of fourth segment. The hind margins of the abdominal segments are dark, not whitish hyaline as they are in *T. orchidarum*, Ckll., and other African species.

Hab. Madagascar. British Museum, 95. 21.

For other species of this genus see Ann. & Mag. Nat. Hist., April 1908, p. 343. "*T. orthonnæ*," as there given, is a misprint for *T. othonnæ*. Friese (1909) has added a species *T. sjöstedti*, described under *Diagonozus*.

LXVIII.—*Descriptions of a new Hawk-Moth and some new Syntomidæ.* By the Hon. WALTER ROTHSCHILD, Ph.D.

I. *Meganoton hyloicoides*, sp. n.

At first sight this insect resembles a giant *Hyloicus francki*.

♂. Palpi cinnamon-brown mixed with grey; head and tegulæ black, bordered with dark cinnamon-rufous; thorax and patagia pale yellowish brown, with a broad central black band; abdomen rufous-cinnamon, with brown central band and darker edges to segments. Fore wing: base buffy brown, basal third blackish brown, with five or six irregular dark maroon and grey transverse zigzag bands; rest of wing rufous-cinnamon, with irregular white, maroon, and grey bands and patches; a large apico-costal sooty patch. Hind wing: inner three-fourths cinnamon-brown, with indistinct black patches near inner area; outer fourth black powdered with yellowish grey; fringe cinnamon-rufous mixed with whitish.

Underside of both wings cinnamon-rufous, with two transverse irregular black bands on fore wings and three more distinct ones on hind wing.

Length of fore wing 74 mm.

Female (in coll. Kenrick) much larger and paler.

Hab. Ninay Valley, Central Arfak Mountains, Dutch New Guinea, Nov. 1908 to January 1909 (*A. E. Pratt Coll.*).

3 ♂♂.

II. Syntomidæ.

(1) *Cosmosoma flavothorax*, sp. n.

♂. Legs clay-brown; pectus golden yellow; palpi black; antennæ fuscous; head metallic blue; collar black; tegulæ and patagia sooty brown, a blue metallic spot at base of patagia; thorax golden yellow; abdomen golden yellow, last four segments black, with dorsal and lateral rows of metallic-blue patches. Fore wing hyaline; costa, nervures, inner margin, and apical fourth of wing sooty brown; discocellular stigma black. Hind wing hyaline, margins and nervures sooty black.

Length of fore wing, ♂ 21 mm.

Hab. Doubtful.

1 ♂.

(1 a) *Cosmosoma intensa*, sp. n.

♂ ♀. Similar to *C. flavothorax*, but darker; yellow areas of body orange and dark areas of wings sooty black.

Hab. Cananche, Cundinamarca, June 1903 (*M. de Mathan*); Paramba, Ecuador.

1 ♂, 1 ♀.

Probably a subspecies of the preceding.

(2) *Cosmosoma mathani*, sp. n.

♂. Legs black-brown; pectus golden and black; palpi black; antennæ black, tips whitish; head metallic blue; thorax black, two spots on tegulæ, two at base of patagia, and central band metallic blue; abdomen golden-orange, last four segments and basal segment above black; a central and lateral lines on whole abdomen metallic blue. Fore wing hyaline; costal, inner, and terminal margins, nervures, and apical fifth of wing sooty black. Hind wing hyaline, nervures and margins sooty black.

♀. Similar, but black wing-areas wider and metallic-blue spots on orange portion of abdomen absent.

Length of fore wing, ♂ 21, ♀ 24 mm.

Hab. Cananche, Cundinamarca, July 1903 (*M. de Mathan*).

2 ♂♂, 3 ♀♀.

(3) *Cosmosoma chiriquensis*, sp. n.

♂ ♀. Legs, head, and antennæ sooty black; pectus golden yellow; thorax golden yellow; abdomen golden yellow, a patch on segments 2 and 3 and last two segments black. Fore wing hyaline, base golden yellow followed by black patch; costa, outer margin, and apical fifth black. Hind wing hyaline, base yellow, apex and fringe black; nervures of both wings very narrowly marked black.

Length of fore wing, ♂ 22, ♀ 19 mm.

Hab. Chiriqui, Panama.

1 ♂, 1 ♀.

(4) *Cosmosoma rosenbergi*, sp. n.

♀. Fore coxæ white; legs, pectus, and antennæ dark sooty brown; head black, frons edged with white; collar white; thorax black, with white central patch; abdomen, first three segments orange, each with dorsal patch of black, rest of abdomen black. Fore wing hyaline; nervures, outer and inner margins, and terminal fifth black; two white spots at base; basal two-fifths of costa hyaline, rest black. Hind wing hyaline, margins and nervures black.

♂. Differs in having abdomen yellow, only last two segments black.

Length of fore wing 20 mm.

Hab. Paramba, Ecuador, 3500 metres (dry season), April 1897; Chimbo, Ecuador, 2000 metres, August 1897 (*W. F. H. Rosenberg*); Rio Dagua, Columbia (*W. F. H. Rosenberg*).

3 ♀♀, 2 ♂♂.

(5) *Cosmosoma watsoni*, sp. n.

♀. Pectus, legs, head, and thorax sooty black; abdomen golden yellow, last three segments sooty black. Fore wings hyaline opalescent; base, costa, nervures, a large cellular stigma, and inner margin sooty black, outer fourth sooty black, excised internally between veins 4 and 6. Hind wing hyaline, nervures and broad margins sooty black.

Length of fore wing 20 mm.

Hab. Bouquete, Chiriqui, 3500 feet, Chiriqui (*Watson*).

2 ♀♀.

(6) *Cosmosoma buchwaldi*, sp. n.

♀. Pectus sooty brown; legs sooty brown, fore tibiæ and coxæ yellow; head sooty brown, vertex white, antennæ and thorax sooty brown; abdomen sooty brown, yellow on sides of first three segments. Fore wing hyaline (yellowish); nervures, outer margin, apical fifth, and large cellular stigma sooty black; basal third of costa hyaline, rest sooty black, inner margin sooty black, with two orange lines on each side of vein 1 from base for one-third its length. Hind wing hyaline (yellowish); apex, nervures, and margins sooty black.

Length of fore wing 17 mm.

Hab. Quevedo, Ecuador (v. *Buchwald*).

1 ♀.

(7) *Cosmosoma klagesi*, sp. n.

♀. Pectus white; legs sooty brown; antennæ black; head black, frons edged with white; thorax black, with central white patch; abdomen orange. Fore wing hyaline; nervures, inner margin, and apical third of wing black; two white spots at base, basal fourth of costa hyaline, rest black. Hind wing hyaline; apex, margins, and nervures black.

Length of fore wing 15 mm.

Hab. Caparo, Trinidad, Nov. 1905 (*S. M. Klages*).

1 ♀.

(8) *Cosmosoma ockendeni*, sp. n.

♀. Pectus yellow; legs, head, antennæ, and thorax black; abdomen, first three segments orange with lateral black band, rest black. Fore wing hyaline, basal half of costa hyaline, rest black, nervures and outer and inner margins very narrowly black, apex black. Hind wing hyaline; nervures, apex, and outer margin black, inner margin smoky grey.

Length of fore wing 14 mm.

Hab. Santa Domingo, Carabaya, Peru, 6000 feet (wet season), Nov. 1902 (*G. R. Ockenden*).

1 ♀.

(9) *Cosmosoma analicincta*, sp. n.

♀. Legs brown, tibiæ and coxæ yellow; pectus and head yellow; antennæ black; thorax deep orange; abdomen deep orange, anal segment black. Fore wing hyaline, outer and inner margins and nervures black; basal three-fifths of costa

hyaline, rest of costa and apical fifth of wing black. Hind wing hyaline; outer margin, apex, and nervures black, inner area hyaline.

Length of fore wing 13 mm.

Hab. La Oroya, Rio Inambari, S.E. Peru, 3100 feet (wet season), March 1905; La Union, Rio Huacamayo, Carabaya, Peru, 2000 feet (wet season), Nov. 1904 (*G. R. Ockenden*).

2 ♀ ♀.

(10) *Cosmosoma plagiata*, sp. n.

♀. Pectus yellow; legs, head, antennæ, and thorax black; abdomen yellow, anal segment and a large dorsal patch on segments 3, 4, and 5 black. Fore wing hyaline; nervures, outer and inner margins, a large discocellular stigma, and apical fourth of wing black; at tornus a black patch; basal two-thirds of costa hyaline, rest black. Hind wing hyaline; apex, tornus, and nervures black, inner area hyaline.

Length of fore wing 15 mm.

Hab. Santo Domingo, Carabaya, Peru, 6500 feet (wet season), Dec. 1902 (*G. R. Ockenden*).

1 ♀.

(11) *Gymnelia baroni*, sp. n.

♂. Pectus black; first two pairs of legs black, with white bands at joints, third pair black, with tarsi and spurs white; head black, with two minute white spots at base of antennæ; antennæ deep oil-green; thorax black, outer half of tegulæ brick-red; abdomen black, a pair of brick-red spots on segments 1, 5, 6, and 7; the whole body above and below very hairy. Fore wing hyaline golden; nervures, apical fifth, inner margin, and large discocellular stigma black, with oily sheen; costa oil-green, with basal brick-red patch; an orange streak on inner margin. Hind wing hyaline golden, with nervures and very broad margins black.

Length of fore wing 20 mm.

Hab. Zamora, Ecuador, 3000-4000 feet (*O. T. Baron*).

1 ♂.

(12) *Gymnelia ockendeni*, sp. n.

♀. Pectus black; legs black, fore tibiæ and coxæ crimson; head, antennæ, and thorax black; abdomen above black, with two crimson lateral dots on second and third segments, below black, with crimson patch on last segment and a white spot

on each side of second and third. Fore and hind wings hyaline, base broadly black, nervures and margins black.

Length of fore wing 17 mm.

Hab. Santo Domingo, Carabaya, Peru, 6500 feet (wet season), Nov. 1902 (*G. R. Ockenden*).

1 ♀.

(13) *Gymnelia pilosa*, sp. n.

♀. Pectus black; legs black and white; head black; antennæ black, white tips; tegulæ black, with white central spot; patagia black, with white marginal fringe of long hairs; thorax black; abdomen black, with deep orange rings and scattered long white hairs. Fore wings hyaline yellowish, more brown near nervures; base black, with white spot; inner margin black, with broad yellow band above it at basal half, an orange dash on outer half; a large discocellular stigma; nervures and outer margin black; wing between veins 6 and 8 at outer margin strongly excised, and a large black spot at the excision; basal two-thirds of costa hyaline, rest black. Hind wing hyaline, base black, basal half covered with a whitish fluorescence; inner area sooty grey, with long white hairs; tornus, outer margin, nervures, and large cellular stigma black.

Length of fore wing 20 mm.

Hab. Marcapata, E. Peru, 10,800 feet (*G. R. Ockenden*).

1 ♀.

(14) *Isanthrene mathani*, sp. n.

♂ ♀. Pectus black, with metallic-blue spots; legs dark brown, with blue metallic bands and white on coxæ; head black, with three metallic-blue spots; antennæ black; tegulæ black, apical third bright orange; patagia bright orange, with black borders and a basal blue spot; thorax black, with four blue spots; abdomen metallic blue; a basal transverse yellow band; a dorsal black longitudinal band and very narrow intersegmental orange lines, each segment edged with black, last segment entirely orange. Fore wing hyaline yellow; outer margin, nervures, and large apical patch black; four-fifths of costa and inner margin orange, rest black. Hind wing hyaline yellow; fringe, tornus, and nervures black.

Length of fore wing 21 mm.

Hab. Cananche, Cundinamarca, June 1903 (*M. de Mathan*); Columbia (*A. E. Pratt*).

2 ♂ ♂, 1 ♀.

LXIX.—*Descriptions of Four new African Snakes in the British Museum.* By G. A. BOULENGER, F.R.S.

(Published by permission of the Trustees of the British Museum.)

Helicops gendrii.

Eye rather small; rostral much broader than deep, hardly visible from above, where it forms a suture with the bell-shaped internasal; frontal once and a half as long as broad, as long as its distance from the end of the snout, a little shorter than the parietals; loreal scarcely longer than deep; one or two præoculars, two postoculars, and two or three suboculars, separating the eye from the labials; nine or ten upper labials; temporals 1 + 2 or 3; two pairs of chin-shields, the anterior in contact with five or six lower labials. Scales in 25 rows, dorsals strongly, laterals faintly keeled. Ventrals 151–153; anal divided; subcaudals 60–64. Black above, pinkish yellow beneath, the two colours sharply defined on the outer row of scales; a series of dark spots along the middle of the lower surface of the tail.

Total length 630 mm.; tail 150.

Two female specimens from Labé, French Guinea, presented by Dr. E. Gendre.

Simocephalus unicolor.

Agreeing very closely with *S. capensis*, Smith, but differing in the following points:—Two superposed loreals; two præoculars, lower very small; three postoculars. Uniform dark brown above and beneath.

Total length 1240 mm.

A single female specimen (V. 228; C.?) from Fort Hall, Kenya District, British East Africa, 4000 ft., presented by Mr. S. L. Hinde.

Aparallactus christyi.

Diameter of eye greater than its distance from the oral margin. Rostral broader than deep, the portion visible from above measuring two-thirds its distance from the frontal; internasals shorter than the præfrontals; frontal once and a half as long as broad, longer than its distance from the end of the snout, much shorter than the parietals; nasal divided, in contact with the præocular; one postocular; a single temporal; seven upper labials, third and fourth entering the

eye, sixth forming a suture with the parietal; first lower labial in contact with its fellow behind the symphysial; two pairs of chin-shields, subequal in size, the anterior in contact with four lower labials. Scales in 15 rows. Ventrals 163; anal entire; subcaudals 34. Dark olive-grey above, with a yellowish nuchal collar; upper lip and lower parts yellowish, posterior ventrals and subcaudals with small dark spots.

Total length 270 mm.; tail 35.

A single female specimen from the Mabira Forest, Chagwe, W. of Ripon Falls, Uganda, presented by Dr. C. Christy.

Vipera hindii.

Snout rounded, with obtuse canthus; eye moderate; rostral as deep as broad, divided into two by a transverse suture; upper surface of head and temples with imbricate strongly keeled scales; no supraocular shield; 10 scales in a transverse series from eye to eye, 11 round the eye; 8 upper labials, third and fourth separated from the eye by one series of scales; three lower labials in contact with the chin-shields. Scales in 25 rows, sharply keeled, outer row feebly keeled. Ventrals 133; anal entire; subcaudals 34. Brown above, with two alternating series of darker, yellow-edged, ocellar spots along the middle of the back and smaller dark spots on the sides; a yellow line along the upper lip; lower parts greyish olive, speckled with black.

Total length 300 mm.; tail 40.

A single male specimen from Fort Hall, Kenya District, 4000 ft., presented by Mr. S. L. Hinde.

LXX.—*Notes on the Gastropod Foot and Branchial Cavity.*

By HILDA M. BISHOP, University College of Wales, Aberystwyth.

[Plates XII. & XIII.]

1. *Introductory.*

THE main point of this work has been the correlation of the structural features of the foot of various Gastropods with its observed functional activities.

For this purpose the following types have been studied:—

1. *Haliotis tuberculata*, alive and in section.

2. *Patella vulgata*, alive and in section.

3. *Trochus crassus* and *T. ziziphinus*, alive and in section.
4. *Paludina vivipara*, alive, by dissection, and in section.
5. *Littorina litorea*, *L. obtusata*, and *L. rudis*, alive and in section, *L. litorea* also by dissection, and *Lacuna* alive.
6. *Cypræa pyrum* and *C. europæa*, the former by means of dissection and by series of sections, the latter living and by series of sections.

The Gastropod foot has been studied by most observers from the point of view of its function as a creeping-organ. It is with certain subsidiary functions of the foot, such as adhesion at rest, retraction into the shell, &c., that these notes are chiefly concerned.

With regard to creeping, from my observations I am led to believe that the manner in which it is effected is somewhat as follows:—

The front part of the foot is extended forwards by the pumping of blood into that region, and also by contraction of the transverse muscle-fibres, which causes the stretching of the longitudinal fibres and narrows the foot. The contraction of these transverse muscle-fibres and that of the oblique muscle-fibres causes the formation of furrows in the creeping surface of the foot, and the forward extension of the foot gives to the fibres which lie perpendicular to that surface an oblique direction forwards. These perpendicular fibres contract, and the result is the bringing forwards of the visceral mass and at the same time the restoration to these muscle-fibres of their original direction vertical to the substratum, but at a point in front of the original one. The contraction of the longitudinal fibres brings the hinder part of the foot forwards, and restores to the transverse fibres their full length, so broadening the foot-sole. This completes the cycle, which then starts afresh.

I cannot agree with Biedermann's opinion (1905) that the longitudinal muscle-fibres are all-important in creeping. In the same paper he says that, if only the head-end of the foot of *Helix* touches a glass plate, there immediately arises a set of locomotor waves in the foot-sole, which spreads to the parts not in contact, but no such system arises if even as much as half of the hinder end of the foot touches the plate when the head is not in contact. This hints that though the waves appear at the back end of the foot and travel forwards, yet they have their origin in the head region, *i. e.* they are controlled by the nerve-centres there. To *Haliotis*, however, this description does not apply, for very often this form

re-attaches itself by means of the back end of the foot, the contact of which with the substratum starts the wave-system.

This might possibly be correlated with the presence in the foot of *Haliotis* of longitudinal ganglionated pedal cords, which are absent from that of *Helix*, the nerve-centres in which type take the form of a pair of pedal ganglia in the anterior part of the foot.

2. Adhesion at Rest.

When at rest, *Patella*, *Haliotis*, *Trochus*, *Cypræa*, *Paludina*, and often *Littorina*, adhere to the substratum by the creeping-surface of the foot; the adhesion is between two moist surfaces—the substratum, moist with water or mucus, and the foot-sole, which is covered with mucus secreted by the sub-epithelial gland-cells. The chief muscle-fibres brought into play in adhesion are: those having a direction vertical to the creeping-surface, which compress the foot from above downwards, and the transverse and longitudinal fibres, which by their contraction bring the greatest possible number of perpendicular fibres above a certain area of the substratum, producing firm adhesion. The amount of reduction of the creeping-surface by the contraction of the transverse and longitudinal muscle-fibres varies among the different genera, and is correlated with the shape and relative size of the shell, since it is by means of the shell that the exposed parts of the body must be protected when the animal is at rest.

Patella has a very broad oval foot, which does not extend beyond the cap-shaped shell during creeping, so that it shows very little contraction of the creeping-surface during adhesion. In the case of *Haliotis* there is more contraction, but the shape of the outline of the foot is little altered.

When *Trochus* is creeping the outline of the foot is long and narrow, but on coming to rest the creeping-surface is reduced and becomes oval in outline (and in *Littorina litorea* and *L. obtusata*).

The foot of *Cypræa europæa* is very long and narrow when creeping, and has a straight anterior margin and a somewhat pointed posterior one; but when adhering, the outline of the creeping-surface is broader and oval in shape and is about half of the length to which it attains when creeping.

Paludina has a broad oval foot, with a straight anterior margin, and the creeping-surface is little reduced in adhesion.

The species of *Littorina* which live high up the shore—*L. obtusata*, *L. rudis*, and *L. neritoides*—show a specialization in their method of adhesion, as an adaptation to their high-

tide habits. They have acquired a habit of adhering to the rock when out of water by the rim of the shell, with the foot entirely retracted. This is effected by means of mucus, which hardens on exposure to the air, and so cements the shell to the rock. The entire retraction of the foot lessens the danger of access of drier air to the branchial cavity, which would harden the mucus contained in it, thus injuring the gills.

Lacuna, a member of the Littorinidæ, has been seen to creep against the surface-film, and to let itself down from this by a mucus-thread from about the middle of the foot.

Individuals of *Cypræa europæa* kept in tanks have been observed to creep along the sides of the tank above the surface of the water, remain fixed for a time with the front end of the foot folded back over the head-region, and then to gradually lift the foot from the side of the tank, beginning at the front. This continued until the animal remained fixed only by the extreme back end of the foot, and finally the weight became too great and it fell back into the water. In its natural surroundings the animal creeps on the under side of a stone or rock, and exactly the same process is gone through, except that it becomes detached from the substratum and remains suspended by a mucus-thread from the extreme back end of the foot. The difference in the position of the mucus-thread relatively to the foot in *Lacuna* and *Cypræa* is probably due to the difference in the distribution of weight in *Cypræa* from that in *Lacuna*, the visceral hump in *Cypræa* being coiled symmetrically over the foot, while that of *Lacuna* is coiled on the right side of the animal; and also perhaps to the fact that the end of the foot in *Cypræa*, which no longer possesses an operculum, is freer than is the case in the operculate *Lacuna*. The mucus is secreted largely probably by the anterior glandular groove of the foot.

Cypræa creeps about between tide-marks, especially upon the under surfaces of rocks, stones, and weed. Siphonate forms are commonly supposed to be purely carnivorous, but individuals of *Cypræa* living in tanks have been found to browse upon seaweeds, particularly *Ulva latissima*. Their habit of creeping upon the under surfaces of rocks &c. probably accounts for the external symmetry of the body with regard to the centre of gravity, for symmetrical distribution of weight would be an advantage in the maintenance of such a position.

3. Protection and Retraction.

In many primitive Gastropods protection is secured by bringing down the shell over the animal, e. g. *Patella* and *Haliotis*. The shell-muscle in the most primitive condition is paired, but in *Patella* the two shell-muscles have lengthened posteriorly and have fused to give a horseshoe-shaped muscle, and in *Haliotis* the right one has developed considerably and has become central in position, while the left one has become extremely reduced. In Gastropods which have the visceral hump and shell coiled into a spiral, protection is secured by retraction of the animal into the shell. In the case of forms possessing an operculum, the protection is more complete than in those which have not this structure.

Pleurotomaria beyrichii, one of the most primitive coiled forms, possesses a horny area, an imperfect operculum, on the upper surface of the back end of the foot (Woodward), which may serve as a protection against the friction of the shell and against exposure when creeping.

The method of retraction of the foot is different in the various genera.

Cypræa possesses no operculum; it is a descendant of operculate forms which have lost this structure since the establishment of a unilateral columellar muscle. In retraction, the foot is folded from side to side, the middle longitudinal line of the foot being drawn up by contraction of the muscle-fibres from the shell-muscle to the creeping-surface (Pl. XII. fig. 1). This is probably correlated with the long narrow shape of the shell-mouth. This method of retraction involves very little danger of injury to the longitudinal pedal cords where these are present (*C. pyrum*), and therefore packing arrangements are much less elaborate than in *Trochus*, where much transverse folding of the foot takes place. In some cases, e. g. *C. pyrum*, the back end of the foot is folded downwards and forwards in retraction—which perhaps indicates incomplete adaptation to the loss of an operculum.

In *Trochus* the sole of the foot is folded considerably in retraction, the principal fold being in a transverse direction in *T. umbilicaris* and *T. lineatus* (fig. 3), and in a vertical direction in *T. zizyphinus*, *Cypræa*, and *Haliotis*, where the foot is folded from side to side. This folding of the foot would be liable to injure the longitudinal pedal nerve-cords, and each is surrounded by a mass of loose connective tissue which protects it from contact with the contracting muscle-fibres. In *Paludina* the front part of the foot is folded in

two lateral folds and the back part curled forwards in retraction (fig. 2). In *Littorina* far less folding of the surface and more contraction takes place (fig. 4). The reduction and loss of the epipodium is probably partly correlated with the more complete development of the habit of retraction in the Monotocard Prosobranchs.

The mode of contraction is also correlated with the arrangement and character of the nerve-supply.

In *Trochus* the longitudinal cords are obviously a drawback to contraction of the creeping-surface in the middle line, since nerve-tissue is non-contractile. Hence the surface of the foot is thrown into folds (fig. 3). In the species in which the foot is folded from back to front, this would render the nerve-cords liable to injury if they were not protected in some way from contact with the contracting muscle-fibres; therefore the cords are packed in very loose connective tissue full of blood-spaces, and a large blood-space above and between them serves as a cushion when the foot is folded from front to back. There are oblique muscle-fibres crossing below the blood-space and between the nerve-cords which are a further protection to the latter.

In *Paludina* the nerve-supply of the foot is centred in a pair of pedal ganglia and a pair of longitudinal nerve-cords. To secure the ganglia from injury during retraction they are packed in connective tissue, and a large blood-space runs between them from between the pedal cords. Besides this central channel, the pedal cords are further protected by being each surrounded by a small blood-space.

In *Littorina* the pedal cords have disappeared and the nerve-cells supplying the foot are concentrated in the pedal ganglia. This greatly simplifies the question of retraction, for concentration of the surface is possible to a far greater extent than in *Trochus*. Freer disposition of muscle-fibres in the vertical plane is possible, and these, by their simultaneous contraction, pull up the whole foot. The result is that no great folds are produced, as in the case of *Trochus*, though a certain amount of wrinkling of the surface takes place.

4. Re-attachment.

Forms such as *Patella*, *Trochus*, and *Littorina*, living on the exposed surface of rocks and weed, and *Haliotis* and *Cypræa*, which creep on the under side of boulders in the wave-disturbed zone, are subject to a constant danger of being knocked away from their attachment to the sub-

stratum. *Paludina* is also subject to the same danger, though in a less degree, because it inhabits freshwater streams and ponds. These forms have different methods of re-attaching themselves after being separated from the substratum.

Haliotis, when knocked away from attachment to the under side of a stone, uses the back end of the foot in attempting to re-attach itself. This part of the foot is moved about, usually several times on each side of the shell, until it comes in contact with the substratum. This back end and either side of the foot are brought into contact with the surface of the rock or stone &c., and the muscle-fibres perpendicular to it contract. This contraction brings a fresh part of the foot-sole into contact with the rock, and the muscle-fibres perpendicular to it contract and bring still more of the foot-sole into contact, and so on. Finally, the shell and visceral hump are pulled up, and the normal position is regained. The animal can re-attach itself by means of either side of the foot, because, owing to the reduction of the spirally-coiled condition of the visceral hump, the weight is practically symmetrical in distribution.

When disturbed, *Trochus*, *Cypræa*, and *Littorina* retract into the shell, but, being active forms, they soon push out of the shell, examine the surroundings with the tentacles (in the case of *Trochus*, if under water, with the epipodial tentacles first), and then move the foot about to find a suitable object on which to fix themselves. These three genera and *Paludina* re-attach themselves in essentially the same way as does *Haliotis*, except that the front end and right side of the foot are used. In the case of *Trochus*, *Littorina*, and *Paludina*, the back end of the foot is not available for this purpose, owing to the presence of the operculum, while *Cypræa* has descended from operculate forms. Also, probably, the habit of using the front end of the foot is correlated with the arrangement of the visceral hump, and it is the front part which is most richly supplied with blood and possesses the chief sensory developments and the most important mucus-glands.

5. Notes on the Ctenidium in the above Genera.

The ctenidium of *Cypræa* represents the ordinary Pectinibranch type, possessing only one series of leaflets, though in this genus the curving of the ctenidium is a modification to the peculiar form of the branchial cavity. The shape of the leaflets in *C. pyrum* differs from that in *C. europæa*. In *C. pyrum* the leaflet is long and rather narrow, the afferent

and efferent edges being about equal in length (fig. 5). In *C. europæa* the afferent edge is short and the leaflet has a long line of attachment to the mantle, so that only a small part of the leaflet is actually free (fig. 6).

The afferent edge of a leaflet is that which is turned towards the branchial roof, and the efferent edge faces ventrally, *i. e.* lies uppermost when the roof of the branchial cavity is turned back.

The structure of the leaflets is similar in the two species (fig. 8). Skeletal tissue stretches along each edge of the leaflet from the efferent edge, where it is considerably thickened, but dies out at a short distance from this edge before it reaches the afferent edge. At the point of attachment of the efferent edge to the branchial roof the skeleton of one leaflet is continuous with that of the next. The thickening of the skeleton forms a definite skeletal rod, covering which is a layer of cells some of which are apparently glandular, mucus-secreting, and others are no doubt sensory. Stretching down from the thickened part of the skeleton on each side of the leaflet is a layer of rather low squarish cells with central nuclei, possessing cilia on their free surface. The cilia of one leaflet, coming into contact with those of the next, keep the leaflets apart, and so prevent the ctenidium from collapsing. The epithelium of the rest of the leaflet consists of fairly low cells. The internal structure, as in all the other types described, consists of scattered connective-tissue cells with large blood-spaces between them.

A comparison of *Cypræa* with other types as regards the structure of the ctenidium is interesting.

In *Emarginula*, the skeleton of the leaflets is similar to that in *Cypræa*, but the cells covering the efferent edge do not appear to be glandular and the cilia-bearing cells are much higher, with central nuclei (fig. 7).

The structure of the leaflets in *Haliotis* is somewhat similar to that in *Emarginula*, but cilia are borne also by the cells which cover the efferent edge, so that those cells corresponding to the cilia-bearing layer in *Emarginula* and *Cypræa* are less clearly marked off in this genus (Fleure, 1904).

In *Trochus*, the thickened parts of the skeleton on each side of the leaflet are further apart than in the preceding genera, and *Trochus* resembles *Cypræa* and *Emarginula* in the fact that cilia are borne only by a layer of cells on each side of the leaflet, and not on the edge as in *Haliotis*. This layer consists of cells similar to those in *Emarginula*, but the nuclei are rather basal than central.

In *Paludina*, the leaflets are long and narrow, the efferent

and afferent edges being both long and the line of attachment short, so that they project very freely into the branchial cavity. The structure of the leaflets is very similar to that in *Cypræa*, except that here the cells corresponding to the ciliated cells of that genus are much higher, with central nuclei, and cilia are apparently absent or poorly developed. This fact is perhaps correlated with the shape of the leaflet (Pl. XIII. fig. 9). The ctenidial leaflets in *Littorina* differ from all those already described in possessing practically no skeleton.

In *L. litorea* the sides of the leaflet towards the efferent edge are slightly strengthened by a small amount of skeletal tissue. Cilia are borne by a layer of cells on each side corresponding to that in *Cypræa*, *Paludina*, &c., which stretches almost to the efferent edge of the leaflet and is not very definitely marked off from the cells covering that edge. The cilia-bearing cells are rather high and narrow, with basal nuclei (fig. 10).

In *L. obtusata* there seems to be no skeleton present, and the cilia-bearing cells are very high and narrow, with basal nuclei (fig. 11).

In *Littorina* the afferent edges of the leaflets are continued for some distance along the branchial roof as ridges in its surface. This and the degeneration of the gill-skeleton are modifications probably arising from the high-tide habitat of *Littorina*. The skeleton of the ctenidial leaflets in *Cypræa* resembles most closely that of *Emarginula*, *Haliotis*, and *Paludina*, and the structure is most similar to that of *Paludina*.

As would be expected, the structure of the leaflets in *L. litorea*, the low-tide form, shows less divergence from the primitive type than that of *L. obtusata*, which lives higher up the tide.

Prof. G. C. Bourne, discussing the structure of the ctenidium of *Septaria*, as characteristic of the Neritidæ, describes a cilia-bearing region similar to that in the genera described above, and states that there are cilia on the margin of the lamella (cf. the above description for *Haliotis*). He found, however, no supporting rods or skeletal bars in the lamellæ of *Septaria* (Bourne, 1908).

6. Notes on the Mucus-Glands in the Branchial Cavity of *Littorina*.

In *Littorina*, there is a good deal of variation in the position and extent of the mucus-gland among the different species, and some difference exists between the two sexes in this

respect. It is weakly developed in the common species, and in its place we find a vascular network (*cf.* Pelseneer, 1895).

In *L. litorea*, in the male (fig. 12) there are two glandular areas—a large one on the ctenidial side of the rectum and a smaller one on the other, *i. e.* the right side.

In the female (fig. 13) there is a good deal of glandular tissue on the ctenidial side, but none on the other, along which the oviduct runs.

In *L. obtusata*, in the male (fig. 14) there is a very small amount of glandular tissue on the ctenidial side and a fairly large amount on the other; in the female (fig. 15) there is no definite gland at all.

In *L. rudis* (fig. 16) the glandular areas in the male are somewhat similar to those of *L. obtusata*, but in this species in the female a small one is present on the ctenidial side of the rectum (fig. 17).

Thus the low-tide species, *L. litorea*, possesses the most highly developed mucus-tissue in the branchial cavity.

Its poorer development in the high-tide species, *L. obtusata* and *L. rudis*, may perhaps be correlated with the habit adopted by these species of complete retraction into the shell during rest, by which means the branchial cavity is perfectly protected, and also to their habit of remaining uncovered by the tide, for mucus hardens on exposure to the air, and if there were a great quantity of mucus present in the branchial cavity, the latter might become clogged.

Pelseneer (1895) agrees that the mucus-gland is weak in *Littorina*, less so in *L. litorea* than in the other common species.

Bibliographical Summary.

1880. SIMROTH, H.—“Das Fussnervensystem von *Paludina vivipara*.”
Zeitsch. f. wiss. Zool. xxxv.
1882. CARRIÈRE, J.—“Die Fussdrüsen der Prosobranchier und das Wassergefäßsystem der Lamellibranchien und Gastropoden.”
Arch. f. mikr. Anat. xxi.
1883. HOUSSAY, F.—“Opercule et glandes du pied des Gastéropodes.”
Arch. Zool. exp. sér. 2, tome ii.
1887. BOUVIER, E. L.—“Système nerveux des Gastéropodes Prosobranchies.” Ann. Sci. Nat. sér. 7, tome iii.
1890. THIELE, J.—“Ueber Sinnesorgane der Seitenlinie und das Nervensystem von Mollusken.” Zeitsch. f. wiss. Zool. Bd. xlix.
1890. BOUVIER, E. L.—“Sur le Système nerveux des Cyprées.” Zool. Anz. xiii.
1890. HALLER, B.—“Die Morphologie der Prosobranchier.—II. *Cypræa testudinaria*.” Morph. Jahrb. xvi.

1892. THIELE, J.—"Beiträge zur Kenntniss der Mollusken.—1. Ueber das Epipodium." Zeitsch. f. wiss. Zool. liii.
1894. HALLER, B.—Studien über docoglosse und rhipidoglosse Prosobranchier. Leipzig, 1894.
1895. PELSENER, P.—"Prosobranches aériens et Pulmonés branchifères." Arch. de Biol. t. xiv.
1897. CAR, L.—"Movements of Freshwater Gastropods." Biol. Centralblatt, xvii. 1897.
1897. THIELE, J.—"Beiträge zur Kenntniss der Mollusken.—2. Ueber Hautdrüsen und ihre Derivate." Zeitsch. f. wiss. Zool. lxii.
1901. JORDAN, H.—"Die Physiologie der Lokomotion bei *Aplysia limacina*." Zeitsch. f. Biologie, München, Bd. 41.
1903. DAVIS, J. R. A., and FLEURE, H. J.—"*Patella*." L. M. B. C. Memoirs.
1904. FLEURE, H. J.—"Zur Anatomie und Phylogenie von *Haliotis tuberculata*." Jena Zeitsch. Bd. 39.
1904. BOHN, C.—"Oscillations des animaux littoraux synchrones de la marée." C. R. Acad. Sci. cxxxix. p. 610 & p. 646.
1905. BIEDERMANN, W.—"Studien über vergleichenden Physiologie der peristaltischen Bewegungen.—II. Die lokomotorischen Wellen der Schneckensohle." Archiv für gesammte Physiologie, cvii.
1907. ROBERT, A.—"Remarques sur la progression des Rhipidoglosses." Bull. Soc. Zool. France, xxxii.
1907. VLES.—"Sur les ondes pédieuses des Mollusques reptateurs." C. R. Acad. Sci. cxlv.
1907. VLES et DUBOIS.—"Sur la reptation des Fissurelles." Bull. Soc. zool. France, xxxii.
1908. BOURNE, G. C.—"Contributions to Morphology of Neritacea.—1. The Neritidæ." Proc. Zool. Soc. London.

EXPLANATION OF PLATES XII. & XIII.

- Fig. 1. The foot of *C. europæa* retracted. *s.*, siphon; *m.*, mantle. $\times 6$.
- Fig. 2. Foot of *Paludina vivipara* retracted, $\times 2$. *op.*, operculum.
- Fig. 3. Foot of *Trochus crassus*, Montagu, retracted, $\times 2$. *ep.tent.*, epipodial tentacles.
- Fig. 4. Foot of *Littorina litorea* retracted, $\times 4$.
- Fig. 5. Ctenidial leaflet of *Cypræa pyrum*, $\times 15$. *eff.v.*, efferent ctenidial vessel; *eff.*, efferent edge of leaflet; *aff.*, afferent edge; *skel.*, skeleton of leaflet; *att.*, line of attachment of leaflet to branchial roof.
- Fig. 6. Ctenidial leaflet of *C. europæa*, $\times 20$.
- Fig. 7. Section of leaflet of *Emarginula*, highly magnified.
- Fig. 8. Ditto of *Cypræa pyrum*, highly magnified.
- Fig. 9. Ditto of *Paludina vivipara*, highly magnified.
- Fig. 10. Ditto of *Littorina litorea*, highly magnified.
- Fig. 11. Ditto of *Littorina obtusata*, highly magnified.
- Fig. 12. Branchial cavity of *L. litorea*, ♂. *m.gl.*, mucus-gland; *r.*, rectum; *ct.*, ctenidium; *osph.*, osphradium.
- Fig. 13. Ditto ditto, ♀. *g.d.*, gonaduct.
- Fig. 14. Ditto of *L. obtusata*, ♂.
- Fig. 15. Ditto ditto, ♀.
- Fig. 16. Ditto of *L. rudis*, ♂.
- Fig. 17. Ditto ditto, ♀.

Reference letters.

<i>aff.</i> Afferent edge of ctenidial leaflet.	<i>ep.tent.</i> Epipodial tentacles.
<i>ant.gl.gr.</i> Anterior glandular groove.	<i>g.d.</i> Gonaduct.
<i>att.</i> Line of attachment of leaflet to branchial roof.	<i>m.</i> Mantle.
<i>ct.</i> Ctenidium.	<i>m.gl.</i> Mucus-gland.
<i>eff.</i> Efferent edge of ctenidial leaflet.	<i>op.</i> Operculum.
<i>eff.v.</i> Efferent ctenidial vessel.	<i>osph.</i> Osphradium.
	<i>r.</i> Rectum.
	<i>s.</i> Siphon.
	<i>skel.</i> Skeleton of ctenidial leaflet.

LXXI.—*Note on Two Species of the Genus Pandalus.*

By W. T. CALMAN, D.Sc.

(Published by permission of the Trustees of the British Museum.)

IN a revision of the British prawns of the family Pandalidae published in 1899 (Ann. & Mag. Nat. Hist. (7) iii. pp. 27-39) I pointed out that *Pandalus bonnieri*, Caullery, was closely allied to *P. leptocerus*, S. I. Smith, found off the Atlantic coast of North America, the latter species being distinguished, however, by the minutely scabrous surface of the body. Since then Dr. Appellöf has suggested ('Meeres-fauna von Bergen,' Heft 2 & 3, Dekapoden Crustaceen, p. 118, 1906) that *P. bonnieri* should be regarded as "nur eine östlich-atlantische Varietät von *leptocerus*," since he found some individuals to have scattered hairs on the carapace (especially on the sides) and on the abdomen, and this view has been adopted by several more recent writers. Having lately had occasion to make a careful comparison of the specimens of both forms in the British Museum collection, I find that they are distinguished by several characters which, though small, are constant as far as our material goes, and show no evidence of intergradation. Whether the two forms are to be regarded as species, subspecies, varieties, or local races I do not know, nor can I regard the question as of much scientific importance in the present state of our knowledge; at all events practical convenience seems best served by retention of the binomial nomenclature.

Pandalus bonnieri, Caullery.

Pandalus bonnieri, Calman, Ann. & Mag. Nat. Hist. (7) iii. p. 34, pls. i.-iv. fig. 3 (1899) (with synonymy); Sars, Rep. Norwegian

Fishery and Marine Invest. i. no. 3, p. 28, pl. viii. figs. 5, 6 (1899) (larval stages).

Pandalus platyceros, Brandt, Nordgaard, Hydrogr. and Biol. Invest. Norwegian Fjords (Bergens Museum), 1905, p. 187.

Pandalus leptocerus, var. *bonnieri*, Appellöf, Meeresfauna von Bergen, Heft 2 & 3, Dekapoden Crustaceen, p. 118 (1906); Wollebaek, Bergens Mus. Aarbog, 1908, no. 12, p. 61; Kemp, Journ. Mar. Biol. Assoc. viii. no. 5, p. 410 (1910).

In addition to the characters of this species given in my former paper (*l. c.*), the following require mention as distinguishing it from *P. leptocerus*.

The surface of the carapace and abdomen is smooth and polished, without trace of rugosity, and with only a few minute scattered hairs, which, as a rule, are only conspicuous near the lower edge on each side of the carapace. These hairs are evenly distributed over the surface, not arranged in rows as in *P. leptocerus*.

The interval separating the first two spines of the rostral crest (on the carapace) is usually much less than that separating the second and third; sometimes it is nearly equal to it, but only in one specimen have I noted it as slightly greater. As a rule, the third spine is behind the orbital notch; I have never seen it distinctly in front.

Fig. 1.



Pandalus bonnieri, Caullery. Proximal part of rostrum (above) and basal segment of antennule (below).

The proximal tooth on the lower edge of the rostrum is relatively short; although sometimes a little longer than in the specimen figured, its length is always much less than the distance from its base to the upper edge of the rostrum (fig. 1).

The basal lobe of the antennule (stylocerite) is very broad and its anterior edge is evenly curved (fig. 1).

The Museum collection includes a large number of specimens of this species from various localities off the east and west coasts of Ireland and the west of Scotland.

Pandalus leptocerus, S. I. Smith.

Pandalus leptocerus, S. I. Smith, Proc. U.S. Nat. Mus. iii. p. 437 (1881); Bull. Mus. Comp. Zool. Harvard, x. p. 58 (1882); Rep. U.S. Comm. Fish. for 1882, p. 367, pl. v. fig. 1 (1884); A. Milne-Edwards, Recueil des Figures de Crustacés nouveaux ou peu connus, pl. xxii. (1883); Mary J. Rathbun, Harriman Alaska Exped. x. p. 43 (1904). *Pandalus falcipes*, Spence Bate, Rep. 'Challenger' Macrura, p. 668, pl. cxv. fig. 2 (1888).

Closely resembling *P. bonnieri*, from which it differs in the following characters:—

"The entire surface of the carapax and abdomen is slightly roughened with short and irregular transverse punctate ridges which give rise to very short bristle-like hairs." This sentence, quoted from S. I. Smith, applies accurately to all the specimens I have seen. On most parts of the surface the ridges assume a crescentic form, giving the appearance of imbricating scales, and they are quite easily seen even when, as is often the case, the hairs have been rubbed off.

Fig. 2.



Pandalus leptocerus, S. I. Smith. Proximal part of rostrum (above) and basal segment of antennule (below).

The interval separating the first two spines of the rostral crest is commonly greater than that separating the second and third; only in one specimen was it seen to be slightly less. As a rule, the third spine is in front of the orbital notch, but in a few specimens it is almost directly above it.

The proximal tooth on the lower edge of the rostrum is

long and falciform; its length is always much greater than the distance from its base to the upper edge of the rostrum (fig. 2).

All the appendages are noticeably more slender in the specimens examined than in specimens of *P. bonnieri* of similar size. The basal lobe of the antennule (stylocerite) is narrower and more produced forwards than in *P. bonnieri*, and there is a slight angulation of its anterior edge which seems to be constant in all the specimens examined (fig. 2). The type specimens of Spence Bate's *P. falcipes* undoubtedly belong to this species.

The Museum collection includes twenty-five specimens of this species from various localities off the east coast of North America, received from the U.S. National Museum and from the collection of the Rev. Canon Norman.

LXXII.—On *Cercocebus aterrimus* and *Cercocebus albigena*.
By ERNST SCHWARZ.

IN 1906 Mr. Pocock described a new species of *Cercocebus* which he called *C. hamlyni*, and which was said to have come from the Upper Congo (this journal, ser. 7, vol. xviii. 1906). This animal still lives at the Zoological Gardens, Regent's Park. It is distinguished by its long whiskers, the peak-shaped sagittal crest, the flesh-coloured naked parts (only a few tan spots in the face), and the light colour, which presents a striking contrast to the dusky coloration of the other members of the genus. When recently visiting the Zoological Gardens at Rotterdam I was greatly astonished to find there two examples of *Cercocebus* which in external form fully agreed with the specimen living in London, while their colour was entirely different. One of them was glossy black all over, only the very long whiskers being greyish brown, with black naked parts. The second specimen was quite white, with pinkish naked parts, with only two tan spots between the brown eyes. Both came, as Dr. Büttikofer kindly informed me, from somewhere on the Upper Congo, and were labelled *Cercocebus aterrimus*, Oudem. A third specimen, fully agreeing with the type of *C. hamlyni*, lives in the Antwerp Zoological Gardens. I must add that in 1899 Dr. Selater described a *Cercocebus conqicus* from a monkey he had seen at the Antwerp Gardens, which was stated to be from Stanley Falls, Congo, and which had flesh-coloured naked parts, and was "remarkable for its prominent crest on the middle of the head and the long hairs on the cheeks";

these latter were white, as seen from the full description as well as from the photograph in the text.

It is quite obvious that all these monkeys present different stages of albinism of the same species, *C. aterrimus*, first described by Oudemans in 1890. The original description is excellent, and points out all the differences which separate it from *C. albigena*, together with a female of which the type specimen was received at the Zoological Gardens, the Hague.

The differences are: *C. albigena* has soft dull black hair and a mantle on the shoulders, while in *C. aterrimus* the fur is coarse, glossy black, and the mantle is absent. There is also present a long brow-fringe in *C. albigena*, but not in *C. aterrimus*. The cheeks of *C. albigena* are quite short-haired, whereas *C. aterrimus* possesses long greyish-brown whiskers partly concealing the ears. In *C. albigena* the crest is occipital in position and broad behind; in *C. aterrimus* the crest is quite vertical in the centre of the crown and pointed.

It so happens that this same species (*C. aterrimus*) has had bestowed upon it another name. When making some remarks on *C. albigena* (Nov. Zool. vol. vii. 1900) Mr. Lydekker mistook the description of *C. aterrimus*, which he referred to a monkey in the British Museum belonging to *C. albigena albigena*, as will be shown below. This monkey has a distinct brow-fringe, no whiskers, a mantle, and an occipital crest, while the monkey he described and figured as *C. albigena rothschildi* undoubtedly is the same as *C. aterrimus* of Oudemans, having no mane nor superciliary fringe, being black all over except the long greyish-brown whiskers, and having the characteristic peak-shaped crest on the crown found in *C. aterrimus*. The British Museum possesses an adult specimen which agrees in all details with *C. aterrimus*, but which unfortunately has no skull. It was collected by Mr. Simpson at Bena Dibele, Lukenye River, South Central Congo. This is the eighth specimen of this species known to me, but the only one with exact locality. Most probably *C. aterrimus* inhabits the large basin south of the Central Congo, the district of the Sankuru River, Lukenye River, &c. The fact that two specimens (the types of both *C. aterrimus* and *C. conqicus*) were said to be from Stanley Falls only confirms me in this opinion. Possibly *Cercocebus aterrimus* occurs together with a subspecies of *Cercocebus albigena*, which is met with from the Cameroons to the Lake District, though it would seem to me that *C. albigena* and its subspecies live rather north of the Congo and in the Lake District, while the species

in question inhabits the country south of the great river. It is specifically distinct from *Cercocebus albigena*.

It is necessary now to settle the question of the local races of *Cercocebus albigena* itself. Lydekker (1900) and Pocock (1906) have considered the subject, but both have arrived at wrong conclusions, principally as they mixed up *C. aterrimus* with this species.

The type of *C. albigena*, Gray, is in the British Museum. It is a young animal, stated to be from "West Africa," and comes, as I suppose, from somewhere on the Lower Congo. A second specimen collected by Du Chaillu fully agrees with it.

They are both black, with a sooty brown mane on the shoulders, the region between the shoulders being darker. The occipital crest is black for its greater part, and only quite behind is it sooty brown. The arms are black, the cheeks greyish; the thighs are sooty brown, only slightly darker than the mane, the feet black. This form must stand as *Cercocebus albigena albigena*, Gray. It inhabits the Lower Congo region.

The second set of specimens comes from Eastern Africa: Uganda (2 specimens); Mpanga Forest (2 specimens); Lake Tanganyika (type of *C. a. johnstoni*, Lyd.); Lake Mweru (type of *C. jamrachi*, Poc.). They are very similar to the preceding ones, but the mane is somewhat lighter, the region between the shoulders not darker, and there are more brown hairs in the occipital crest. The thighs are black or brownish black. One specimen from Lake Tanganyika, the type of *C. a. johnstoni*, does not well agree with this description, the coat being much shorter and the mane very dark. This latter feature, as Prof. O. Neumann pointed out, is due to the youth of the specimen; a young animal from the Welle River justifies this view. The condition of the fur most probably is the consequence of the animal having been kept in captivity. The type of *C. jamrachi*, Pocock, has a distinct brow-fringe, a mane, and an occipital crest, the condition of the fur being quite as in *C. albigena*. It is white all over, with pinkish naked parts and, curiously enough, brown eyes like all the albinistic forms of *C. aterrimus* I have seen. I have no doubt in referring it to *C. albigena*, and, as it comes from the eastern part of its range, to subspecies *johnstoni*, Lyd. *Cercocebus albigena johnstoni* inhabits the Upper Congo and the Lake District from Uganda in the north to Lake Mweru in the south.

Mr. Lydekker, finally, mentions a specimen from Cameroons which he believed to be *C. albigena albigena*. It has a very long light brownish-grey mane, is scarcely darker between the shoulders, and the occipital crest is formed, to a considerable extent, of brownish hairs; in fact, the longest hairs of the crest are brownish grey. The thighs are tinged with greyish brown, though they are not so distinctly differentiated from the general colour as in *C. a. albigena*. On the arms there is a number of light hairs and some with light tips. The underside of the body is not brown as in the other subspecies, but of a greyish tint. Mr. Pocock notes this specimen in his monograph of the genus *Cercocebus*, but he doubts its having come from the Cameroons. At the Berlin Zoological Gardens I remember having seen some Mangabeys of this kind which came from the Cameroons, and, like the specimen in question, had a remarkably light mantle. I think this form is a distinct local race of *C. albigena*; but before bestowing a name on it I want to see some more material.

The species of Mangabeys treated in this paper are therefore:

A. *Cercocebus aterrimus*, Oudemans. *Hab.* Central Congo Basin.

Syn. *Cercocebus congicus*, Schl.
C. hamlyni, Poc.
C. albigena rothschildi, Lyd.
C. albigena, Jentink.

B. *Cercocebus albigena*, Gray. *Distr.* Cameroons to Uganda and Lake Mweru.

1. *C. a. albigena*, Gray. *Hab.* Lower Congo.
2. *C. a. johnstoni*, Lyd. *Hab.* Upper Congo to Uganda and Lake Mweru.

Syn. *C. aterrimus*, O. Neum.
C. jamrachi, Poc.

3. *C. a. subsp.* *Hab.* Cameroons.

Syn. *C. a. albigena*, Lyd.

I may add that the only white monkey of the genus *Cercocebus* known to me is a male of *C. æthiops*, L., in the Zoological Gardens, Frankfurt-a./M. It has pinkish naked parts, red eyes, but a blue scrotum. It has been figured by the late Direktor Schoepf in the 'Leipziger Illustrierte Zeitung' (August 8th, 1907) under the name of *C. albogularis*.

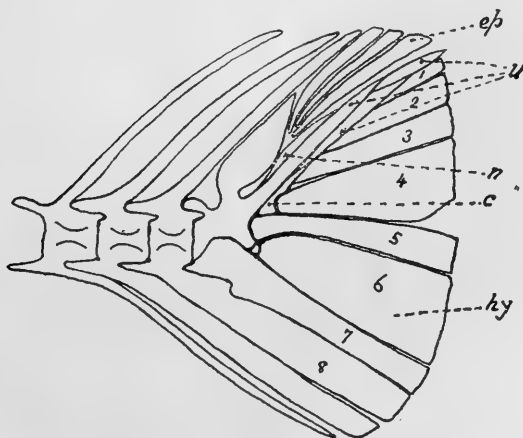
LXXIII.—On the Caudal Fin of the Clupeidæ, and on the Teleostean Urostyle. By C. TATE REGAN, M.A.

(Published by permission of the Trustees of the British Museum.)

It is generally recognized that the Clupeidæ are closely related to the Elopidae, differing from them only in a few features of specialization; consequently a knowledge of the structure of the latter family is essential to an understanding of the anatomical features of the former.

When I wrote an account of the skeleton of the caudal fin of the Elopidae (*supra*, p. 354) it did not occur to me that there could be any question as to the homologies of the elements which I described with those of the Clupeidæ; however, Mr. Whitehouse's note in the last number of the 'Annals' has shown me that I was mistaken, and I therefore supplement my former paper with a description of the caudal fin skeleton of the Clupeidæ, selecting for illustration that of *Chatoessus erebi*.

Fig. 1.

Skeleton of caudal fin of *Chatoessus erebi*.

ep, epaxial basalia (epurals); *u*, uroneurals; *c*, last centrum; *n*, plate representing neural arches of upturned centra; *hy*, hypurals.

If the figure here given be compared with that of *Elops* (p. 355) it will be seen that in both there is a series of three epaxial basalia or epurals (*ep*) and that the hypurals (*hy*) correspond well enough, the main difference being that in

Chatoessus there are only four supporting the upper lobe of the fin, whereas there are five in *Elops*. The third hypural of the lower lobe (marked 7 in the figure of *Chatoessus*) is in each case attached to a centrum, to which there is also united a pair of elements which I term "anterior uroneurals," the union being by suture in *Elops* and by ankylosis in *Chatoessus*; these anterior uroneurals are strong bones, directed upwards and backwards, and can be readily separated from each other right down to their junction with the centrum; they embrace a laminar bone, the paired nature of which is sometimes evident, and which represents, in my opinion, the neural arches of centra behind the one which bears the anterior uroneurals; to the posterior edge of the anterior uroneurals is attached a second pair of bones, posterior uroneurals, and a third smaller distal pair is also present in both genera. In *Elops* the uppermost hypural of the lower caudal lobe is attached to the centrum behind that which bears the anterior uroneurals; in *Chatoessus* this hypural (marked 5 in the figure) has probably ankylosed with its centrum, which is not present as a separate element. The next hypural (4) is articulated with the last centrum in *Elops*, and in *Chatoessus* with a small median element (c) which obviously represents the last centrum; this sends up a spur-like process on each side of the base of the hypural above it, these processes corresponding to similar prolongations of the last centrum in *Elops*, protecting the sides of the notochord and concealed beneath the posterior uroneurals.

Other Clupeidæ do not differ very much from *Chatoessus*; the last centrum may not be recognizable as a distinct element, and the epurals may be reduced in number to two, but on the whole the variation is comparatively unimportant.

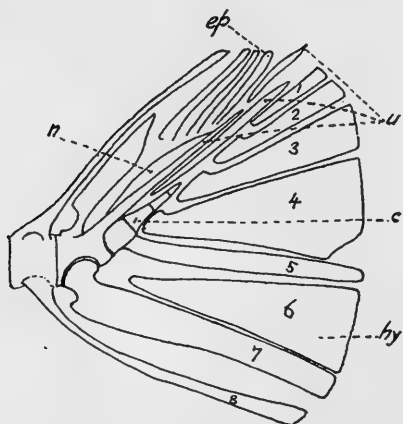
A detailed comparison shows that the Clupeidæ differ from the Elopidae in

- (1) ankylosis of the neural and hæmal arches with the centra;
- (2) ankylosis of the anterior uroneural with the third last centrum;
- (3) disappearance of the penultimate centrum as a separate element;
- (4) reduction or abortion of the last centrum;
- (5) reduction in number of the hypurals of the upper caudal lobe from five to four.

Thanks to the courtesy of Mr. E. T. Newton I am able to give a figure of the caudal fin skeleton of a young *Clupea*, which he has already described and figured (Journ. Quekett Micr. Club, (2) i. 1882, p. 82, pl. iii. fig. 1). I have nothing

to add to Mr. Newton's very full and accurate description but as his figure does not show quite clearly the precise limits of the uroneurals I have made another drawing (fig. 2). The principal differences from the adult *Chatoessus* are that the uroneurals are more slender, the penultimate centrum is distinct from the fifth hypural, and the last centrum is segmented into three, clearly showing that the paired posterior processes already described represent two incomplete centra.

Fig. 2.



Skeleton of caudal fin of a young *Clupea*.
Lettering as in Fig. 1.

The name "urostyle" has not usually been applied to any of the pairs of bones (uroneurals) which protect the terminal part of the notochord in the Clupeidæ and many of the more generalized Teleosts, but has been used to designate the continuous styliform bony investment of the end of the notochord in *Gastrosteus* and in some other fishes. A comparative study leaves no room for doubt that in many cases the urostyle is merely the result of ankylosis of the uroneurals and that centra take little or no part in its formation, and I do not think that there are any fishes in which a urostyle has been formed simply by ankylosis of posterior centra; but that is a matter which requires further investigation. However, there can be no question that in the Clupeidæ there is no urostyle and that the bones so named by Mr. Whitehouse are not derived from centra, but are the anterior of a series of three pairs of bones, the uroneurals, which may be regarded as neural arches pertaining to posterior centra which have aborted.

LXXIV.—*Three new Asiatic Mammals.*

By OLDFIELD THOMAS.

(Published by permission of the Trustees of the British Museum.)

Murina lanosa, sp. n.

M. suilla group; larger and more hairy than the other species.

Size comparatively large, the forearm longer than in any of the other three species. Fur long, soft, and woolly; hairs of back over 8 mm. in length. Whole of interfemoral membrane above fairly well covered with fur, but without a definite posterior fringe. Limbs more hairy than usual, a number of hairs on the carpal joint, base of the metacarpal bones, and a line of thin fur along the outer side of the forearm; hind legs and feet well covered. Below, both limbs and membranes are practically naked. General colour above between clay-colour and cinnamon, the hairs of the back dark slaty for their basal halves. Under surface pale greyish drab, all the hairs dark slaty basally, the ends dull whitish, becoming more drab laterally. The fine hairs on the limbs glossy ochraceous or tawny.

Skull as in *M. suilla*, but larger; the proportions of the premolars as in that species.

Dimensions of the type (the starred measurements taken in the flesh):—

Forearm 37·5 mm.

Head and body *49; tail *42; ear *15; third finger, metacarpal 34, first phalanx 15; lower leg and foot (c. u.) 27·5.

Skull: greatest length 17·1; basi-sinual length 13; zygomatic breadth 9·5; breadth of brain-case 8·1; front of canine to back of m^3 5·6.

Hab. Ceram.

Type. Adult female. B.M. no. 10. 3. 4. 24. Original number 932. Collected September, 1909, by Mr. W. Stalker.

Of the four species of the *suilla* group this is the largest, slightly exceeding *florium* in length of forearm; it is richer in colour than in the greyish *balstoni* and *florium*, about agreeing in this respect with *suilla*; its limbs and interfemoral are more liberally clothed; its under surface is darker coloured, the other three all having some wholly light hairs on the abdomen; and the fur itself is longer and woollier.

Besides Mr. Stalker's specimen now described, the Museum

contains a second example, also from Ceram, received with the Tomes collection, and probably collected by Dr. A. R. Wallace.

Mogera hainana, sp. n.

Intermediate in size between *M. insularis* and *latouchei*.

Colour as in *M. latouchei* or faintly brownér. Tail shorter than in either of the allied species.

Skull with a size-index* of about 460–470, those of *latouchei* and *insularis* being 390–406 and 483–496 respectively. Outer corners of brain-case rounded, not sharply angular. Small upper premolars set obliquely, crowded, overlapping, the first longer than the other two, and more or less completely two-rooted.

Dimensions of the type (measured on skin) :—

Tail 7 mm.; breadth of fore foot 14; hind foot (s. u.) 16.

Skull: greatest length 30·6; breadth of brain-case 15; interorbital breadth 7; palatal length 12·3; front of canine to back of m^3 10·6.

Hab. Hainan. Type from Mount Wuchi.

Type. Adult female. Original number 3. Collected 12th November, 1906, by a native employed by Mr. Alan Owston. Four specimens.

That the mole of Hainan should be a distinct species is quite natural, as the nearest forms geographically are *M. latouchei* of N.W. Fo-kien and *M. insularis* of Formosa. It is, however, curious that while those moles are distinguished from their North Chinese and Japanese relatives by having their anterior premolar small and single-rooted, the new species, the most southern of all, should resemble in this respect the more northern forms.

Tragulus versicolor, sp. n.

Larger than *kanchil*, smaller than *napu*. Anterior half of body fulvous, posterior grey.

Size little exceeding that of members of the *kanchil* group, of which *T. k. affinis* is the local representative, far less than is usual in the *napu* group, to which *T. versicolor* seems to belong. Fur, especially that of the neck and throat, coarse and harsh, as in the *napu* group. Coloration above quite unique in the genus, the head and anterior half of the body fulvous (nearest to "ochraceous buff") as far back as just behind the shoulders; the colour then changes abruptly to grey, clear grey (about no. 6) on the sides, slightly suffused

* See P. Z. S. 1907, p. 463.

with buffy along a narrow dorsal area. No lighter markings over eyes. Ears large, fulvous brown. Nape-line dark grizzled grey, not very sharply defined; sides of neck bright ochraceous buff. Throat-markings well-defined, white and dark fulvous, not blackish. Belly white along the centre, a well-marked rich buffy line separating the white on each side from the grey of the flanks, and breaking it across the loins before it passes down the front of the hind legs. Fore limbs rich fulvous, a narrow line on their inner side proximally white. Hind limbs grey proximally, passing into dull fulvous on the lower leg and feet. Tail above like back at base, becoming more fulvous distally, white below and at extreme end.

Skull rather larger than in *T. kanchil affinis*, much smaller than in *T. napu*, but the tooth-row more approaches in length that of the latter. Bullæ large, rounded, more inflated than in either of the other forms.

Dimensions of the type (measured on the skin):—

Head and body 480 mm.; tail 50; hind foot (c. u.) (circa) 120.

Skull: condylo-basal length 95; greatest breadth 45.5; nasals 34.5×13.3 ; interorbital breadth 29; upper cheek-tooth series 36.6; premolars only 17.2.

Hab. Nhatrang, Annam.

Type. Adult male. B.M. no. 6. 11. 6. 39. Collected 22nd March, 1906, by Dr. J. Vassal. Four specimens.

This striking species is at once distinguishable from all others by the peculiar difference in colour between the anterior and posterior halves of the body, the former fulvous, the latter grey, rather abruptly contrasted with each other.

Although far smaller than is usual in the *napu* group, it is possibly a local representative of it, for it has the coarse hair so characteristic of *napu*, its teeth are nearly as large, and the *kanchil* group is already represented in Annam by *T. k. affinis*, of which Dr. Vassal has also sent specimens.

BIBLIOGRAPHICAL NOTICE.

Catalogue of the Lepidoptera Phalaenæ in the British Museum.
Vol. IX. *Catalogue of the Noctuidæ in the Collection of the British Museum.* By Sir GEORGE F. HAMPSON, Bart. London: Printed by Order of the Trustees, 1910. Pp. xv, 552; figs. 247; pls. cxxxvii.—cxlvii.

Less than a year separates the publication of this volume of Sir George F. Hampson's epoch-making work from that of the last, the Preface to Vol. VIII. being dated March 18th, 1909, and that of Vol. IX. January 21st, 1910. Vol. IX. "is the third and final part of the very large Noctuid subfamily *Acronyctinæ*; it contains

725 species belonging to 185 genera as compared with 843 species belonging to 96 genera in Vol. VII., and 720 species belonging to 104 genera in Vol. VIII."

This volume commences with a revised table of genera of the subfamily *Acronyctinae* and a folding diagram of the phylogeny; and pages 496-535 are devoted to additions and corrections to Vols. VII. and VIII., and to a list of undetermined species presumed to belong to the *Acronyctinae*.

The execution of the letterpress and illustrations is similar to that of previous volumes, and calls for no special comment. A considerable number of species here dealt with belong to well-known European genera, such as *Gortyna*, *Apamea*, *Hydræcia*, *Pyrria*, *Ipimorpha*, *Calymnia*, *Dicycla*, *Arenostola*, *Cænobia*, *Sesamia*, *Calamia*, *Euterpia*, *Panemeria*, &c., and also several exotic genera, such as *Psychomorpha*, *Ovios*, and *Seudytia*, which have generally been (at least provisionally) referred by previous authors to the families *Agaristidæ*, *Lithosiidæ*, &c.

PROCEEDINGS OF LEARNED SOCIETIES.

GEOLOGICAL SOCIETY.

January 26th, 1910.—Prof. W. J. Sollas, LL.D., Sc.D., F.R.S.,
President, in the Chair.

The following communications were read :—

1. 'On a Skull of *Megalosaurus* from the Great Oolite of Minchinhampton.' By Arthur Smith Woodward, LL.D., F.R.S., F.L.S., Sec. G.S.

The specimen was discovered and prepared by Mr. F. Lewis Bradley, F.G.S., and shows for the first time the skull of *Megalosaurus*. It agrees closely with the Megalosaurian skulls of other genera already discovered in the Jurassic and Cretaceous of North America, and resembles *Ceratosaurus* in possessing a bony horn-core on the nose. As in the jaws of *Megalosaurus* previously known, the premaxilla of the new specimen bears four teeth; but these teeth are so different from those of the typical *M. bucklandi* of the same horizon, that they prove the Minchinhampton fossil to belong to a distinct species.

2. 'The Vertebrate Fauna found in the Cave-Earth at Dog Holes, Warton Crag (Lancashire).' By John Wilfrid Jackson, F.G.S., Assistant Keeper in the Manchester Museum.

The remains described in this communication were obtained during the systematic investigation by the Author of a cave on Warton Crag (West Lancashire) in 1909.

The cave, known as Dog Holes, is situated on the western side of Warton Crag, and opens on a sloping 'pavement' of limestone. It owes its origin to the erosion of a series of master-joints in the Carboniferous Limestone.

The present entrance to the cave is by a vertical drop from the general level of the 'pavement.' This entrance is undoubtedly of secondary origin, and is due to the falling-in of the weakened roof of one of the passages.

The specimens were derived from the cave-earth below the surface-soil in one of the chambers of the cave. They comprise a large series of small vertebrates, including Rodents, Insectivores, Amphibians, Birds, etc. Among the Rodents are some interesting forms, the chief of which are the Arctic and Norwegian Lemmings, and the Northern Vole.

A large series of non-marine Mollusca was found along with these remains, one species being of particular interest, namely *Pyramidula rulerata*, only known in this country by its fossil remains in Pleistocene deposits.

The Pleistocene age of the remains is fully discussed, as well as their possible mode of origin through a former swallow-hole.

In many respects, the cave and its contents bear a striking resemblance to the famous Ightham Fissures.

March 23rd, 1910.—Prof. W. W. Watts, Sc.D., M.Sc., F.R.S.,
President, in the Chair.

The following communication was read:—

'On *Palæoxyris* and other Allied Fossils from the Derbyshire and Nottinghamshire Coalfield.' By Lewis Moysey, B.A., M.B., B.C., F.G.S.

After reviewing the bibliography of *Palæoxyris*, the Author records the finding of 22 specimens from Shipley Clay-pit (Derbyshire), and over 130 from Digby Clay-pit (Nottinghamshire), also several isolated examples from other localities in the district.

He describes *Palæoxyris helicteroides* (Morris): noting especially the presence of a 'beak', which had not, hitherto, been adequately described. He then describes *Palæoxyris prendeli* (Lesquereux) from Shipley Clay-pit, again noticing the formation of the 'beak'. The discovery of *Palæoxyris johnsoni* (Kidston) from Digby is noted, and it is proposed that this fossil be removed into the genus *Vetacapsula*.

The Author also describes a specimen of *Vetacapsula cooperi* (Mackie & Crocker) from Newthorpe Clay-pit (Nottinghamshire). He discusses the differences between this and other specimens, and Mackie's type-specimen, but considers it inadvisable to multiply species.

A review of the bibliography of *Fayolia* is followed by the description of a new species from Shipley Clay-pit; also a small compressed example is described as near to *Fayolia dentata* (Renault & Zeiller). The Author then discusses the distribution of these organisms in time, and their possible affinities with the egg-capsules of the Cestracionts and the Chimæroids.

INDEX to VOL. V.

- ABISPA**, new species of, 49.
Aclonophlebia, new species of, 451.
Acratheus, characters of the new genus, 16.
Ædimorphus, new species of, 374.
Ægeria, new species of, 401.
Agapostemon, new subspecies of, 363.
Alcidamia, new species of, 22.
Aletis, new species of, 399.
Alouatta, new species of, 79.
Amblyapis, characters of the new genus, 362.
Amphiphalera, characters of the new genus, 477.
Anaya, new species of, 316.
Andersen, K., on a new genus of epomophorine bats, 97; on species of the genus *Epomops*, 99.
Andrena, new species of, 260.
Anmenopsyche, new species of, 400.
Antheua, new species of, 474.
Anthophora, new species of, 409.
Aparallactus, new species of, 512.
Arctonyx, new species of, 424.
Aristobulus, characters of the new genus, 16.
Aroa, new species of, 444.
Arrow, G. J., on the lamellicorn beetles of the genus *Peltonotus*, 153.
Arvicanthis, new species of, 85, 353.
Ashmeadiella, new species of, 22.
Astrosclera willeyana, on the affinities of, 380.
Austen, E. E., on a new Indian species of *Musca*, 114.
Azizus, characters of the new genus, 10.
Badezorus, characters of the new genus, 15.
Barrett-Hamilton, G. E. H., on new European bats, 291.
Bather, F. A., on the nomenclature of Echinoderms, 216.
Birds, new, 162.
Bishop, Miss H. M., on the gastropod foot and branchial cavity, 513.
Bombus, new species of, 416.
Books, new:—Lankester's *Treatise in Zoology*, pt. vii. *Appendiculata*, pt. i. *Introduction and Protozoa*, 125; Browne's *Descriptive Catalogue of the Dobrée Collection of European Noctuæ*, 127; Third Annual Report of the Committee of Control of the South African Locust Bureau, 294; Pierce's *Monographic Revision of the Twisted Winged Insects comprising the Order Strepsiptera*, 387; Maxwell-Lefroy's *Indian Insect Life*, 388; *The Fauna of British India, Dermaptera*, 389; Buckman's *Yorkshire Type Ammonites*, 464; *Catalogue of the Noctuidæ in the Collection of the British Museum*, 536.
Boulenger, G. A., on the lizards allied to *Lacerta muralis*, 247; on four new African snakes, 512.
Buckman, S. S., on certain Jurassic strata of South Dorset, 128; on certain Jurassic Ammonites and Brachiopoda, 129.
Burchell, W. J., on the lepidoptera collected by, in Brazil, 322.
Calligaster, new species of, 35.
Calman, Dr. W. T., on new species of wood-boring crustacea from Christmas Island, 181; on two species of the genus *Pandalus*, 524.

- Camptopœum*, new species of, 504.
Caryatis, new species of, 453.
Catarctia, new species of, 488.
Caviria, new species of, 434.
Cebus, new species of, 77.
Cephalophus, new species of, 92, 273.
Cephalopod, on crustacea from the gizzard of a deep-sea, 51.
Ceratina acantha, remarks on, 28.
Cercocebus aterrimus and *C. albigena*, notes on, 527.
Cercopithecus, new species of, 81, 191, 202.
Cerura, new species of, 456.
Chadisra, new species of, 459.
Chelostoma, new species of, 23.
Chelura, new species of, 182.
Chilina, new species of, 111.
Chrysochloris, new species of, 84.
 Clark, A. H., on an interesting structural analogy, 358.
Cleridæ, notes on the, 55.
Clupeidæ, on the caudal fin of the, 531.
 Cobbold, E. S., on trilobites from Comley, 390.
 Cockerell, T. D. A., descriptions and records of bees, 22, 133, 256, 361, 409, 496.
Cœlacanthus, new species of, 5.
Cœlioxyx, new species of, 418; table of the Australian species of, 501.
Coleoptera, new, 70, 153.
Colgar, new species of, 307.
Colletes, table of species of, 365.
Conepatus, new species of, 241.
 Cooper, J. E., on new marine and freshwater shells from the Falkland Islands, 110.
Cosmosoma, new species of, 507.
 Costa's Fauna del Regno di Napoli, dates of publication of, 132.
 Coventry, A. F., on the application of the theory of dwarf males to *Myzostoma*, 378.
Cricetomys, new subspecies of, 106, 198, 279.
Crinoidea, on the supplementary plates in the, 358.
Crocidura, new species of, 175, 369.
Crocisa, new species of, 419.
Crossarchus, new species of, 195.
Crustacea from the gizzard of a deep-sea cephalopod, on, 51; from the Bay of Biscay, on, 158; new, 181.
Cryptoflata, new species of, 303.
Ctenomys, new species of, 242.
Culex, new species of, 264, 268, 376.
Cyamium, new species of, 112.
Dasychira, new species of, 445.
Davisia, characters of the new genus, 113.
Dendromus, new species of, 275.
Desmomys, characters of the new genus, 284.
Diadasia, new species of, 366.
Diandrena, new species of, 24.
Digama, new species of, 452.
Dinara, new species of, 476.
Dioclerus, characters of the new genus, 12.
Diploptera, new, 30.
Dipodillus, new species of, 197, 420.
Diptera, new, 114, 264, 373, 405.
Discoelius, new species of, 38.
 Distant, W. L., on Oriental Capsidæ, 10; on some undescribed Gerrinæ, 140; rhynchotal notes, 297.
Dobsonia, new subspecies of, 384.
 Dollman, G., on new African mammals, 92; on mammals from Northern Rhodesia, 173; on new forms of *Cercopithecus* and *Graphiurus*, 202; on new African dormice, 285.
Dortus, characters of the new genus, 13.
 Druce, H., on new Heterocera from tropical Africa, 393.
 Dunkerly, J. S., on the choanoflagellate genera *Salpingœca* and *Polyœca*, 186.
Echinoids, on some points in the nomenclature of, 117, 216.
Ecrinesomus, characters of the new genus, 2.
Elephantulus, new species of, 95.
Elimus, new species of, 38.
 Elliot, Dr. D. G., on new species of monkeys, 77.
Elopidæ, on the caudal fin of the, 354.
Eohemera, new species of, 401.
Epeolus, new species of, 25.
Epiphœus, new species of, 72.
Epomops, notes on species of the genus, 99.
Erinaceus, new species of, 193.
Eumenes, new species of, 41.
Euodus, characters of the new genus, 150.
Euproctis, new species of, 436.

- Euratas, characters of the new genus, 146.
 Euxerus, new subspecies of, 419.
 Exophila, new species of, 434.
 Fabatus, characters of the new genus, 147.
 Fearnside, W. G., on the Tremadoc slates of S.E. Carnarvonshire, 294.
 Felis, new subspecies of, 205.
 Fentonina, new species of, 473.
 Fisher, W. K., on new Pterasteridæ from the North Pacific, 167; on new genera of starfishes, 171.
 Fishes, new, 1.
 Flatina, new species of, 301.
 Fulton, H. C., on land-shells from the island of Muswar, 370.
 Funisciurus, new subspecies of, 196.
 Gahan, C. J., notes on Cleridæ, 55.
 Galago, new species of, 77, 92.
 Galeruculus, characters of the new genus, 75.
 Gardiner, C. L., on the igneous and associated sedimentary rocks of the Glensaul district, 391.
 Gargetta, new species of, 482.
 Gastropod foot and branchial cavity, on the, 513.
 Gennæus, new species of, 162.
 Geodena, new species of, 454.
 Geological Society, proceedings of the, 128, 214, 294, 390, 537.
 Gephyreaster, characters of the new genus, 171.
 Geraldtonia, characters of the new genus, 311.
 Gerastratus, characters of the new genus, 148.
 Gerris, new species of, 140.
 Gobius minutus, on the life-history and rate of growth in, 217; *G. flavescens*, notes on, 237.
 Graham, Dr. W. M., on new West-African Culicidæ, 264.
 Graphiurus, new species of, 96, 204, 285.
 Greeleyella, new species of, 361.
 Gymnelia, new species of, 510.
 Halictoides, new species of, 361.
 Halictus, new species of, 260.
 Hampson, Sir G. F., on new African moths, 430, 465.
 Heliconius, new subspecies of, 331.
 Helicops, new species of, 512.
 Helogale, new subspecies of, 194.
 Hesperapis, new species of, 24.
 Heteroptera, new, 10, 140.
 Heterozonias, characters of the new genus, 172.
 Hexactinellid sponge-spicules and their names, on, 208, 347.
 Hippolyte gracilis, on the occurrence of, in the British area, 216.
 Hippotion, new species of, 455.
 Homoptera, new, 299.
 Hybomys, characters of the new genus, 85.
 Hymenaster, new species of, 170.
 Hymenoptera, new, 22, 30, 256, 361, 409, 496.
 Hume, Dr. W. F., on the Cretaceous and Eocene strata of Egypt, 129.
 Ichthyura, new species of, 495.
 Idatius, characters of the new genus, 20.
 Isanthrene, new species of, 511.
 Ityræa, new species of, 299.
 Jackson, J. W., on the vertebrate fauna from Dog Holes, 537.
 Janias, characters of the new genus, 145.
 Joseph, E. G., on the lepidoptera collected by Mr. W. J. Burchell in Brazil, 322.
 Jucundus, characters of the new genus, 143.
 Jugurtia, new species of, 33.
 Katamenes, characters of the new genus, 46.
 Kirkpatrick, R., on hexactinellid sponge-spicules and their names, 208, 347; on *Merlia normani*, 288; on the affinities of *Astrosclera willeyana*, 380.
 Labus, new species of, 36.
 Lacerta muralis, on the lizards allied to, 247.
 Lacipa, new species of, 437.
 Lælia, new species of, 439.
 Lagostomus, new species of, 245.
 Lamoriodes, characters of the new genus, 478.
 Lasiocampa, new species of, 396.
 Lasiodera, characters of the new genus, 74.
 Leggada, new species of, 86.
 Lepidoptera, new, 331, 393, 430, 465, 506.
 Leptopoma, new species of, 372.
 Linnæa, new species of, 110.
 Limnoria, new species of, 184.
 Lomadonta, new species of, 396, 451.
 Lophuromys, new species of, 179.

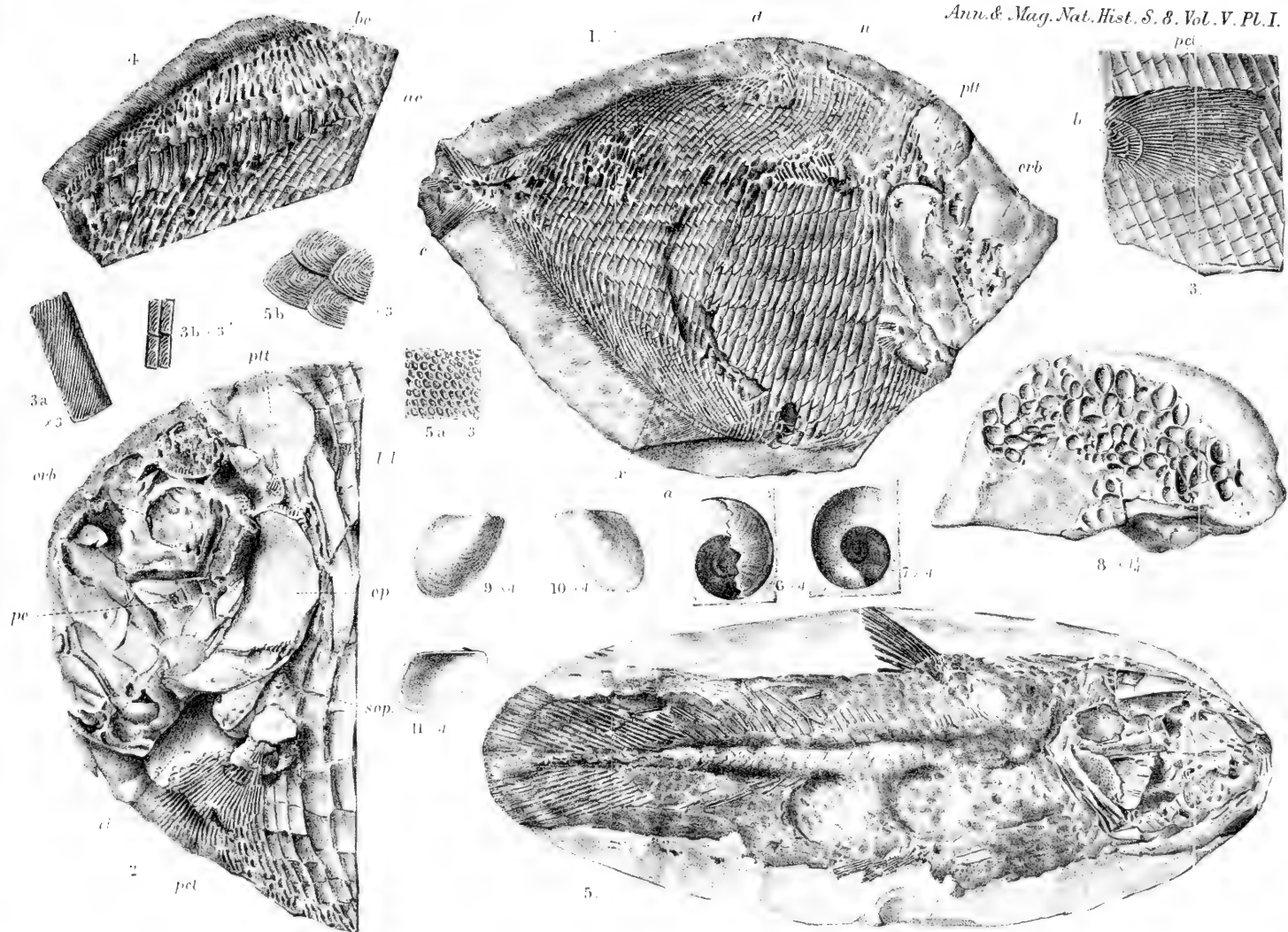
- Macrogalidia*, characters of the new genus, 423.
Macronadata, new species of, 397.
Macropus agilis, on the subspecies of, 164.
Malvinasia, characters of the new genus, 113.
Mammals, new, 77, 83, 92, 97, 106, 165, 175, 191, 202, 205, 239, 273, 276, 282, 285, 291, 350, 351, 369, 383, 419, 422, 424, 534.
 Meade-Waldo, G., on new species of *Diptera*, 30.
Megachile, new species of, 497.
Megaculex, new species of, 267.
Meganoton, new species of, 506.
Melicharia, new species of, 303.
Melissodes, new species of, 256.
Merlia normani, notes on, 288.
Metarctia, new species of, 394.
Metrocoris, new species of, 148.
Microdillus, characters of the new genus, 197.
Modiolarca, new species of, 112.
Mogera, new species of, 535.
Mollusca, new, 8, 110, 370.
Monoculodes gibbosus, description of the male of, 160.
Montezumia, new species of, 47.
 Mortensen, Dr. Th., on some points in the nomenclature of echinoids, 117.
 Moysey, L., on *Palæoxyris* from the Derbyshire and Nottinghamshire coalfield, 538.
Murina, new species of, 534.
Mus, new subspecies of, 277.
Musca, new species of, 114.
Myotis, new species of, 384.
Myxosquamus, new species of, 270.
Myzostoma, on the application of the theory of dwarf males to, 378.
Naboandelus, characters of the new genus, 151.
Nacebus, characters of the new genus, 152.
Naiadites, new species of, 9.
Nannosciurus, new species of, 387.
Necrobioides, characters of the new genus, 76.
Neosalurnis, characters of the new genus, 311.
 Newton, R. B., on upper palæozoic shells from Madagascar, 6.
Nomada, new subspecies of, 368.
Nomia, new species of, 259, 501.
Notoxantha, characters of the new genus, 484.
Nycteris cinerea, remarks on, 240.
 Oates, E. W., on new species of silver-pheasants, 162.
Onychotrechus, new species of, 144.
Orgyia, new species of, 445.
 Osgood, W. H., on new African rodents, 276; on new African shrews, 369.
Otomys, new subspecies of, 207.
Palæorhiza, new species of, 499.
Pandalus, notes on two species of, 524.
Papuina, new species of, 372.
Paradiastema, new species of, 478.
Paradoxurus, new species of, 385, 422.
Parafleta, new species of, 302.
Paragia, key to the genus, 31; new species of, 32.
Parasalurnis, characters of the new genus, 309.
Pareumenes, new species of, 45.
Pectinopalpus, characters of the new genus, 375.
Pelecorhynchus, revision of the genus, 402; new species of, 405.
Pelomys, new subspecies of, 276.
Peltonotus, new species of, 153.
Perodicticus, new species of, 351.
Petrodromus, new species of, 83.
Photinula, new species of, 111.
Phromnia, new species of, 300.
Phylliodes, characters of the new genus, 474.
Pithecia, new species of, 398.
Planispira, new species of, 371.
Planorbis, new species of, 8.
Plerotes, characters of the new genus, 97.
Plusia, new species of, 430.
Polychæta, new, 428.
Polychrysia, new species of, 430.
Polyœca, new species of, 188.
Pontostratiotes abyssicola, remarks on, 53.
Porthesia, new species of, 435.
 Poulton, Prof. E. B., on a new subspecies of *Heliconius nanna*, 331.
 Preston, H. B., on new marine and freshwater shells from the Falkland Islands, 110.
Procavia, new species of, 107, 199, 285.
Prosopis, new species of, 29, 498; table of the Australian species of, 133.

- Protoxerus*, new subspecies of, 85.
Psalisodes, characters of the new genus, 482.
Psallus, new species of, 19.
Psephis, new species of, 114.
Pseudapiconoma, new species of, 391.
Pseudomelecta, note on the genus, 27.
Pteraster, new species of, 168.
Pteredoa, new species of, 435.
Pteropus, new species of, 383.
Ptilocercus, new subspecies of, 426.
Pydna, new species of, 485.
Ragnus, characters of the new genus, 18.
Ramesa, new species of, 483.
Redoa, new species of, 435.
 Reed, F. R. C., on fossils from the Glensaul district, 391.
 Regan, C. T., on the caudal fin of the Elopidae, 354; on the caudal fin of the Clupeidae, 531.
 Reptiles, new, 512.
 Reynolds, Prof. S. H., on the igneous and associated sedimentary rocks of the Glensaul district, 391.
Rhaphidoglossa, new species of, 34.
Rhinolophus, new species of, 192, 292.
Rhynchium, new species of, 50.
 Rhynchotal notes, 297.
 Ricardo, Miss G., a revision of the genus *Pelecorhynchus*, 402.
 Rothschild, Hon. W., on a new hawk-moth and new *Syntomidae*, 506.
Sabactus, characters of the new genus, 21.
Salpingoeca, note on the genus, 186.
Sampsigeramus, characters of the new genus, 17.
Scalmicauda, new species of, 490.
Scaptochirus, new species of, 350.
 Schwarz, E., on the wallabies referred to *Macropus agilis*, 164; on some palm-civets, 422; on *Cercocebus atterimus* and *C. albigena*, 527.
Sciurus, new subspecies of, 386.
 Scott, Dr. T., on crustacea found in the gizzard of a deep-sea cephalopod, 51.
Scrancia, new species of, 479.
Sejanus, characters of the new genus, 20.
Serebæus, characters of the new genus, 11.
 Shann, E., on the life-history and rate of growth in *Gobius minutus*, 217.
 Sharpe, Richard Bowdler, obituary notice of, 130, 215.
 Sherborn, C. D., on the dates of publication of Costa's *Fauna del Regno di Napoli*, 132.
Simocephalus, new species of, 512.
Siphanta, new species of, 304.
Siphantoides, characters of the new genus, 305.
 Smith, S., on the faunal succession of the Upper Bernician, 214.
Sohenus, characters of the new genus, 14.
Soloe, new species of, 455.
Somera, new species of, 463.
 Southern, R., on the Alciopinæ, Tomopteridæ, and Typhloscolecidæ from the Atlantic adjacent to Ireland, 428.
Spatalia, new species of, 455.
Sphæriodiscus, characters of the new genus, 171.
Sponge-spicules, on hexactinellid, 208, 347.
Stauropus, new species of, 465.
Stegomyia, new species of, 271, 373.
Stenaroa, characters of the new genus, 444.
Stenostaura, new species of, 472.
Tachyoryctes, new species of, 276, 421.
Tassia, new species of, 401.
Tatera, new species of, 353.
Teleostean fishes, on the caudal fin of the, 354, 426.
 — urostyle, on the, 531.
Teneroides, characters of the new subgenus, 69.
Teneromimus, characters of the new genus, 70.
Thamnomys, new species of, 278, 282.
 Theobald, F. V., on new *Culicidæ* from Ashanti, 373.
 Thomas, O., on new African mammals, 83, 191, 282, 351, 419; on mammals from Eastern Buenos Ayres, 239; on a new Chinese mole, 350; on new mammals from the E. Indian Archipelago, 383; on new mammals from the Malay Peninsula, 424; on new Asiatic mammals, 534.
Thrinchostoma, new species of, 505.

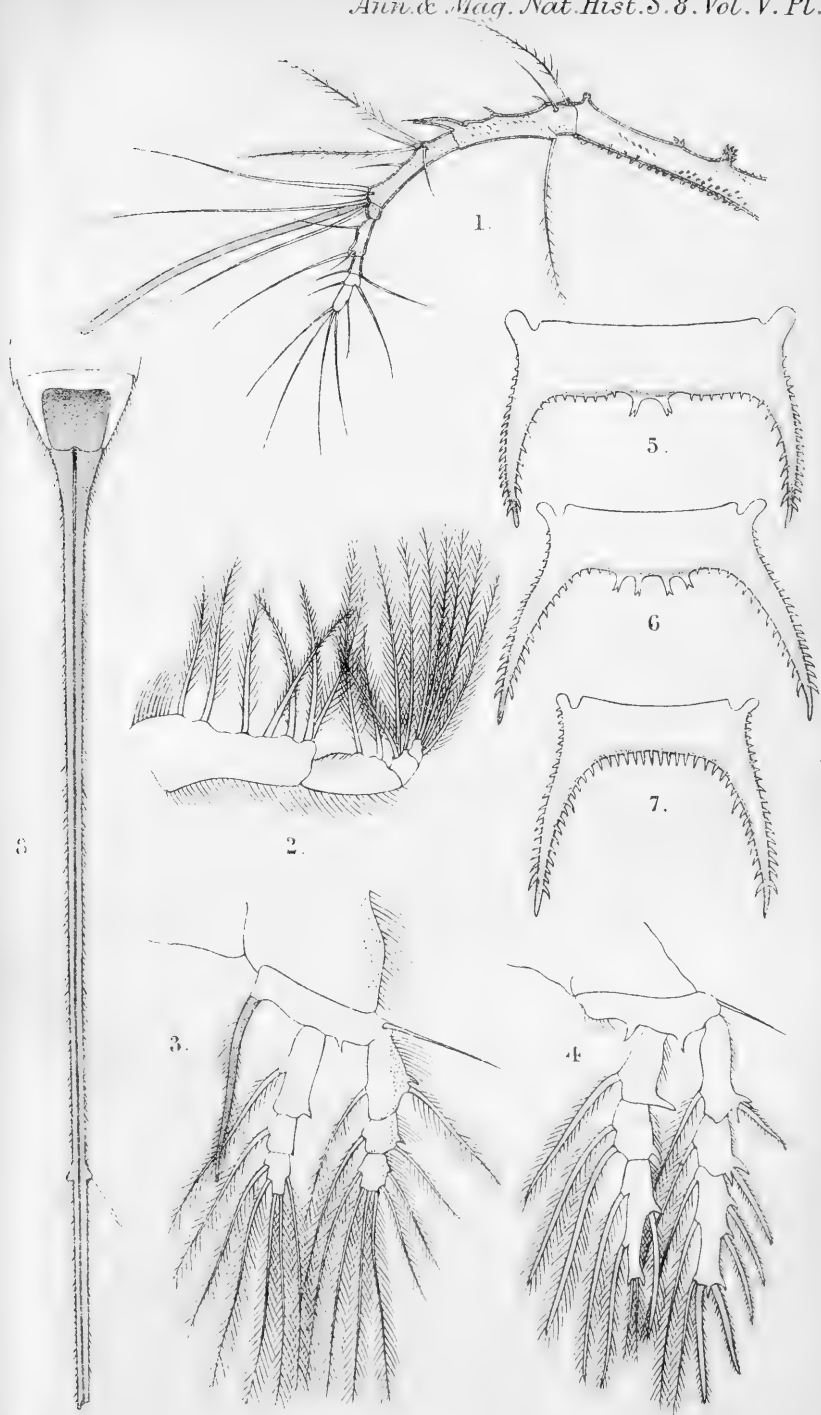
- Thrissacanthias, characters of the new genus, 171.
 Trabala, new species of, 397.
 Tragulus, new species of, 535.
 Traviopsis, new species of, 429.
 Tricholoba, characters of the new genus, 489.
 Triepeolus, new species of, 26.
 Trilocha, new species of, 496.
 Turnaca, new species of, 488.
 Uxantis, new species of, 317.
 Ventidius, characters of the new genus, 149.
 Vespertilio, new species of, 291.
 Vipera, new species of, 513.
 Walker, A. O., on crustacea from the Bay of Biscay, 158; on the occurrence of Hippolyte gracilis in the British Area, 216.
 Whitehouse, R. H., on the teleostean caudal fin, 426.
 Woodward, Dr. A. Smith, on permo-carboniferous fishes from Madagascar, 1; on a skull of Megalosaurus, 537.
 Wroughton, R. C., on new African mammals, 106; on some servals and an Otomys from East Africa, 205; on two new duikers from Mt. Elgon, 273.
 Xenoglossa, new species of, 367.
 Xynthospilopteryx, new species of, 395.
 Zana, new species of, 476.

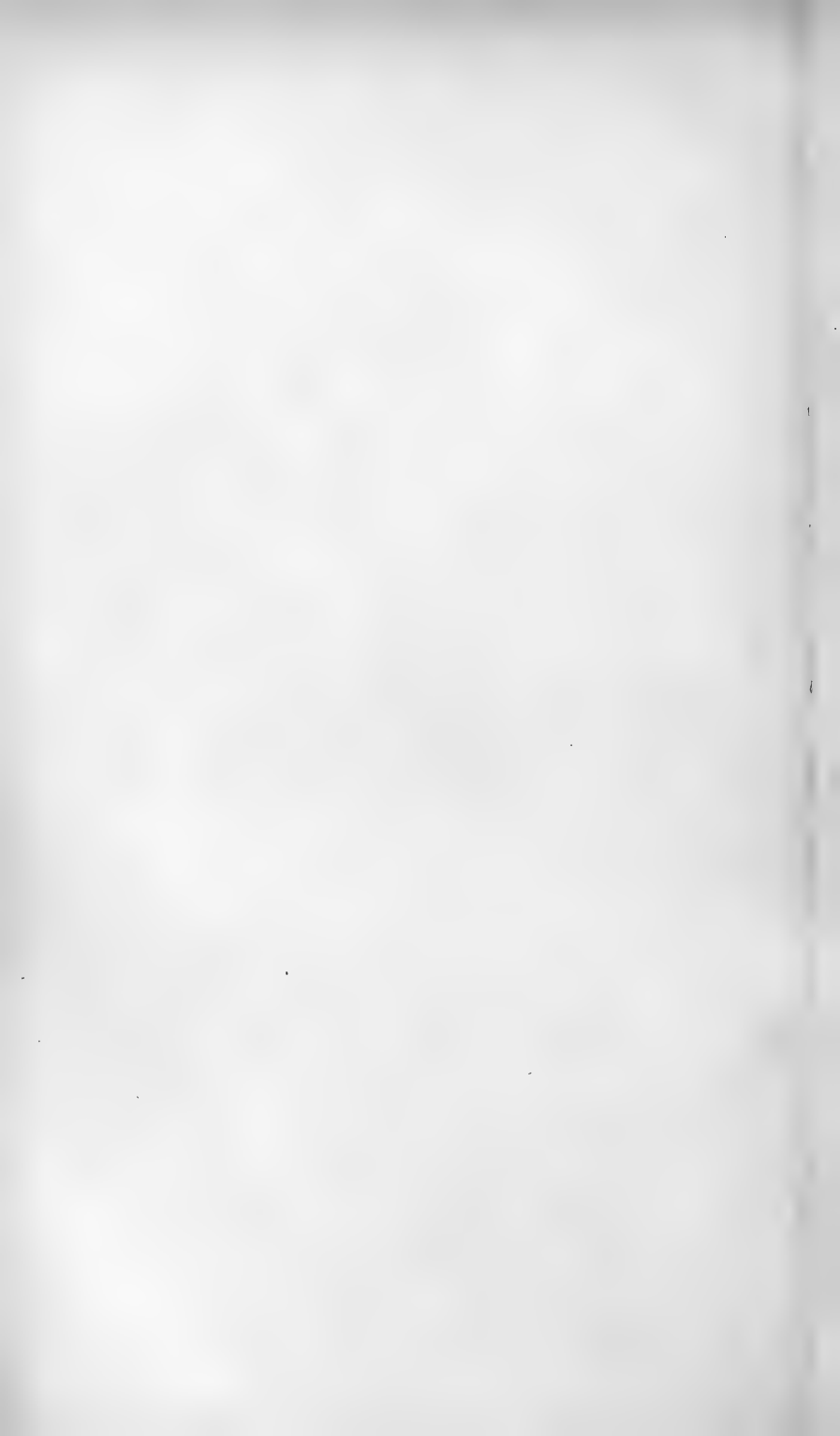
END OF THE FIFTH VOLUME.

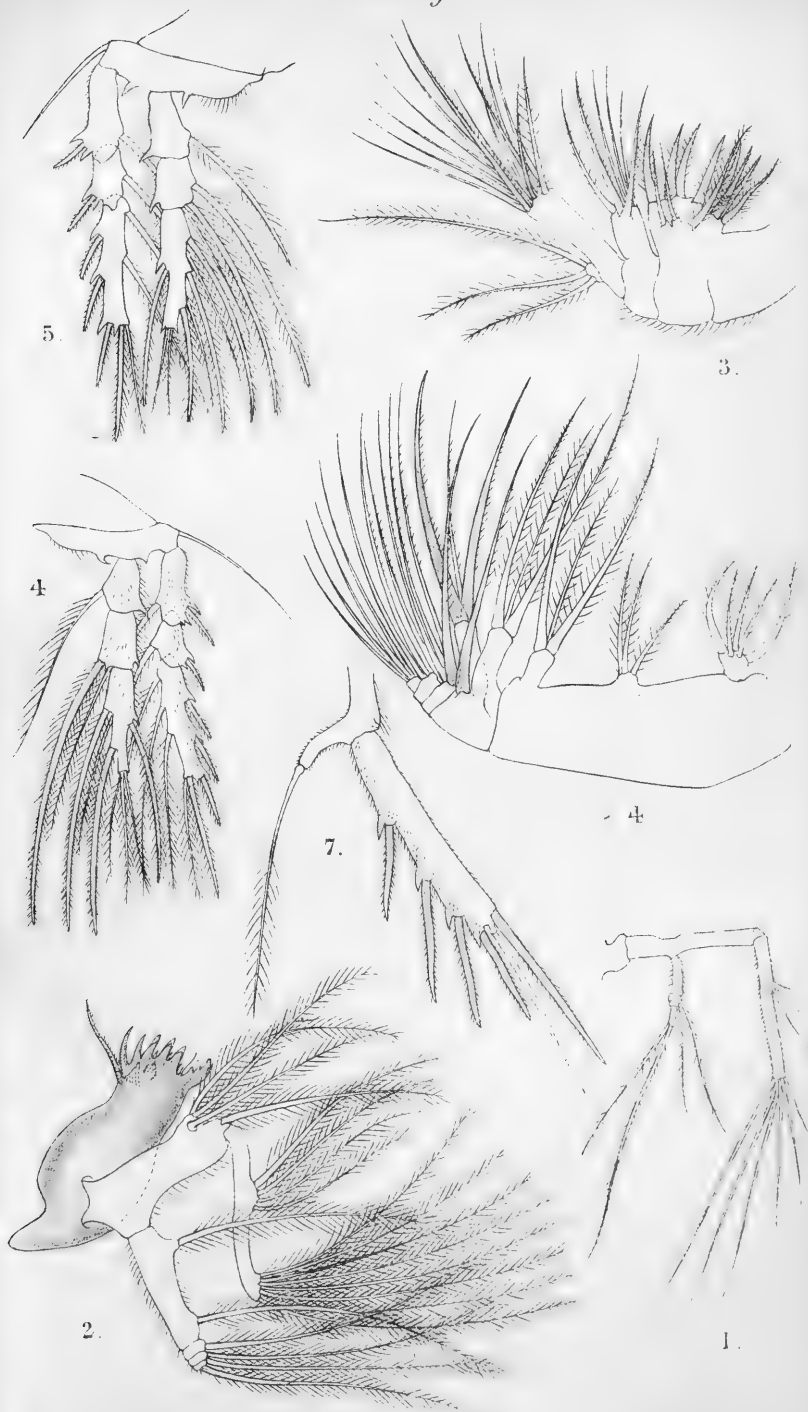










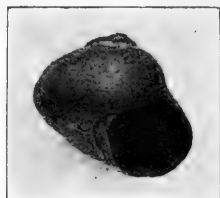




1



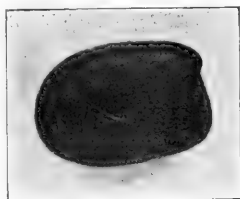
2



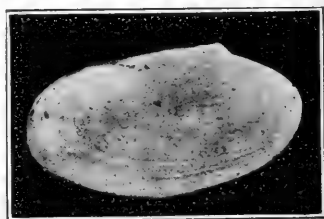
3



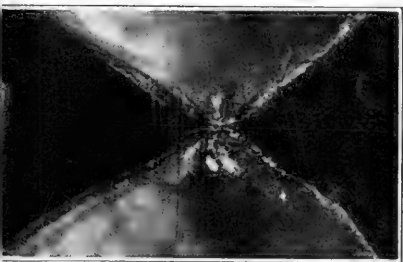
4



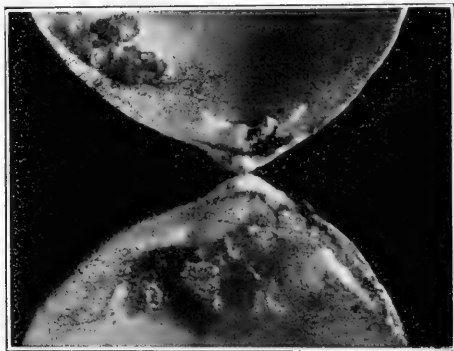
5



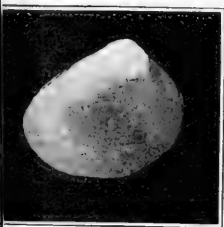
6



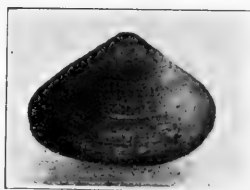
7



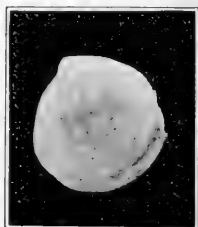
9



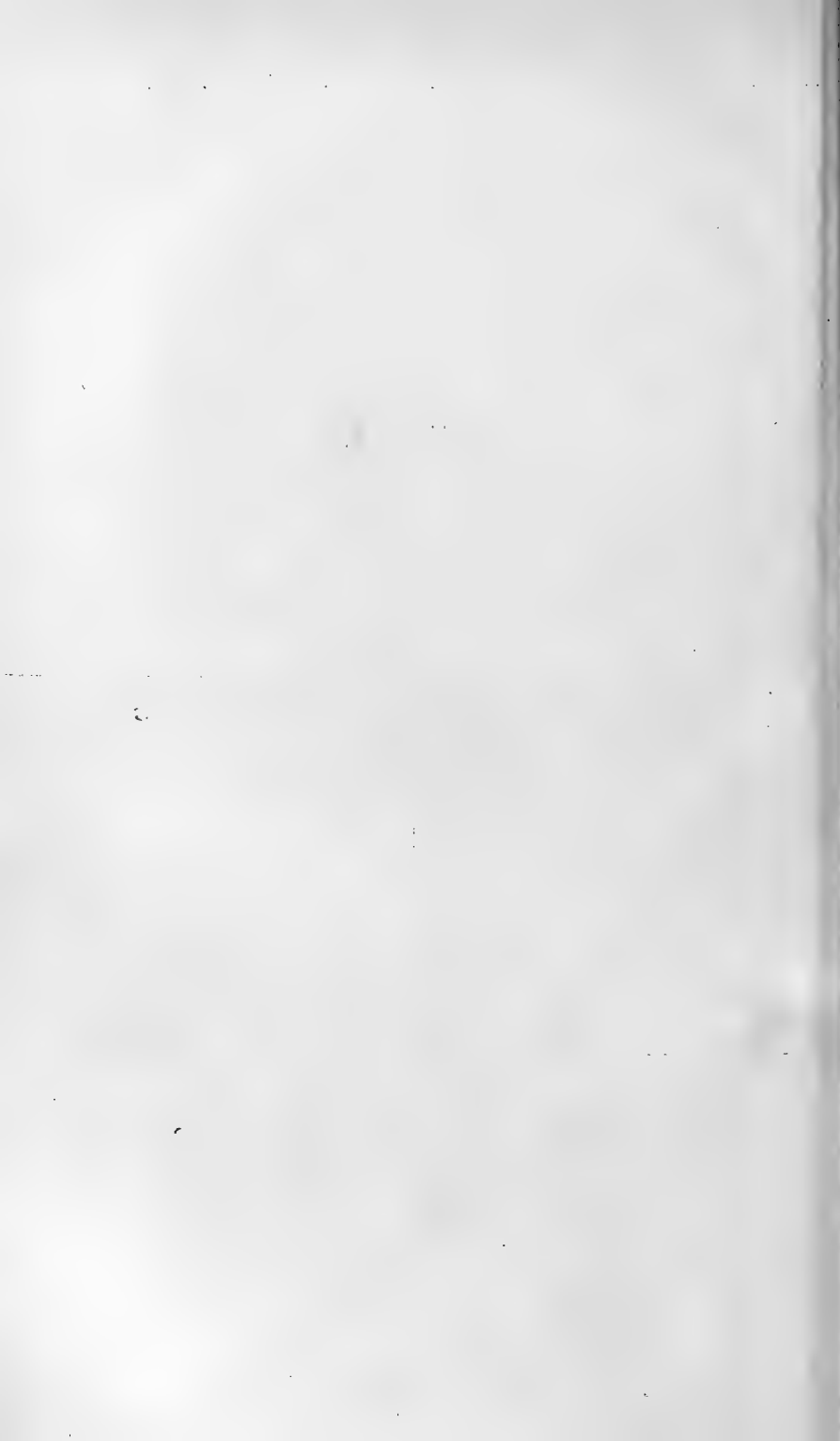
8

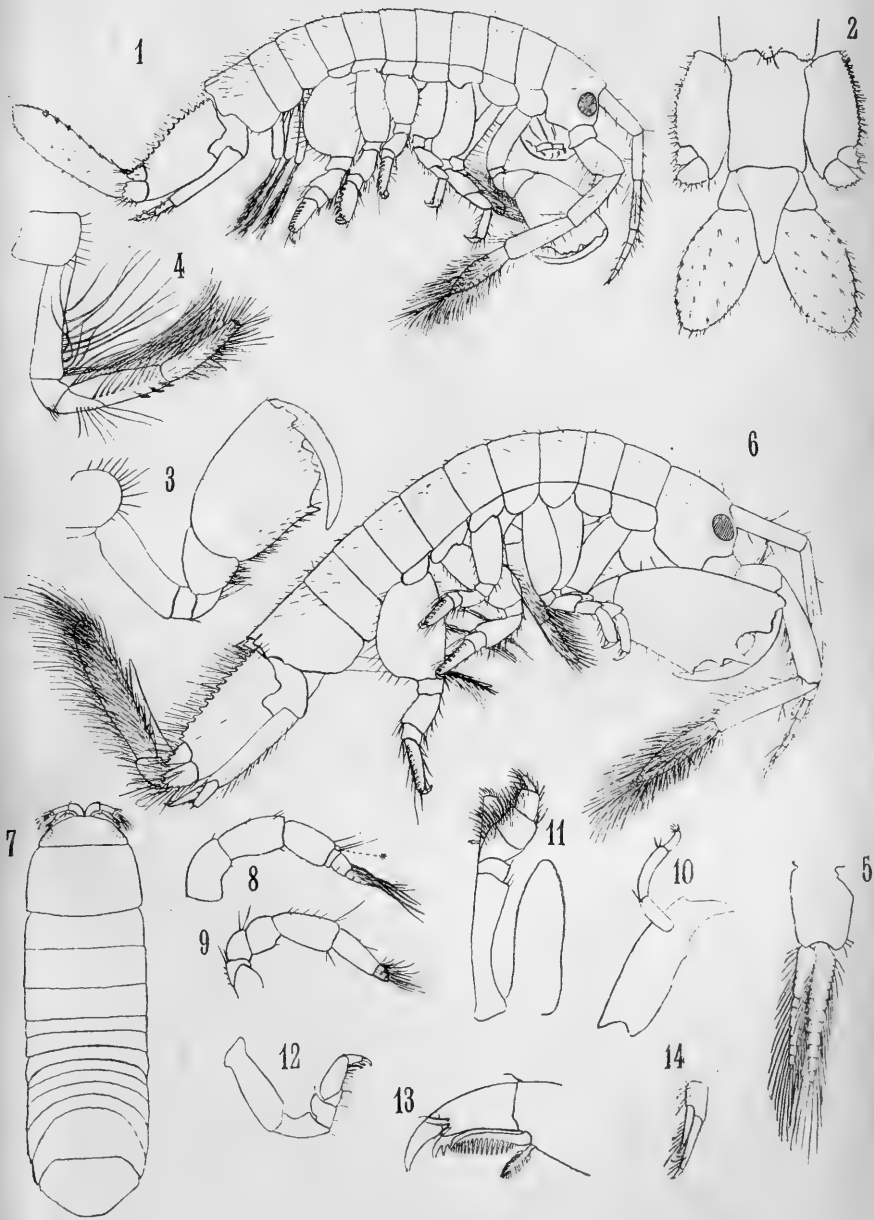


11

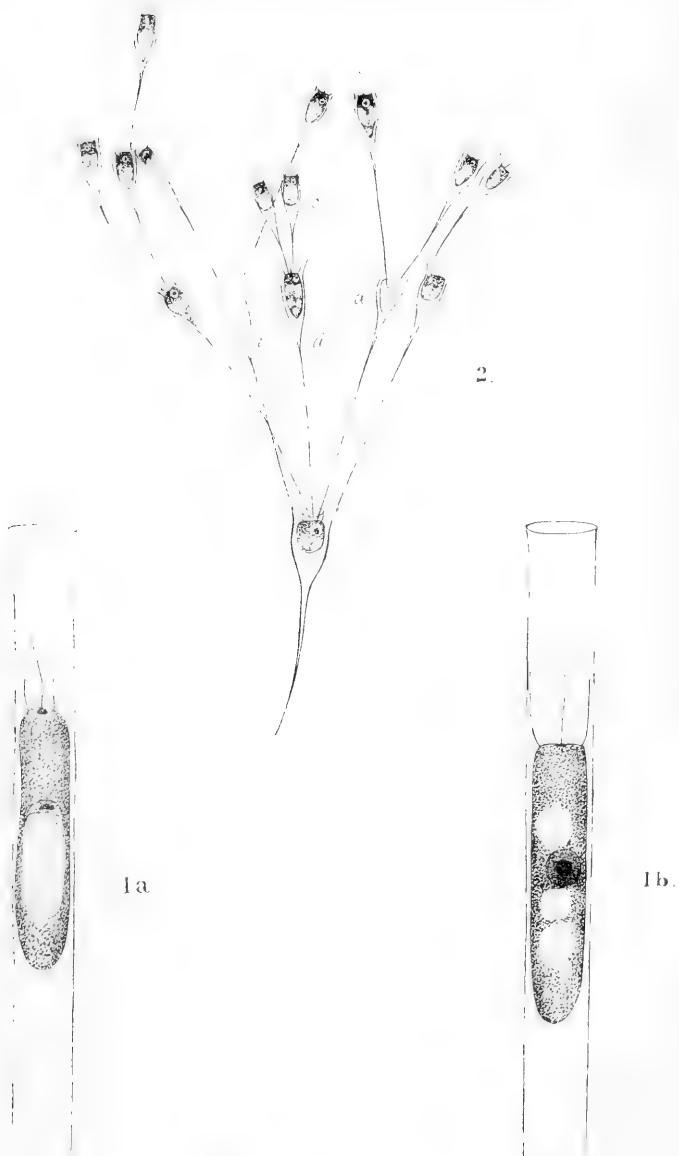


10

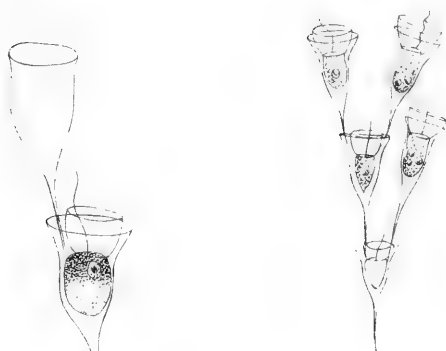




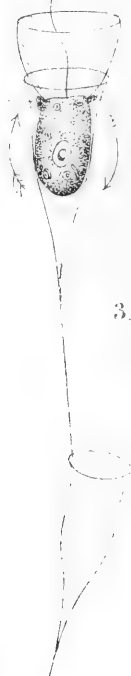




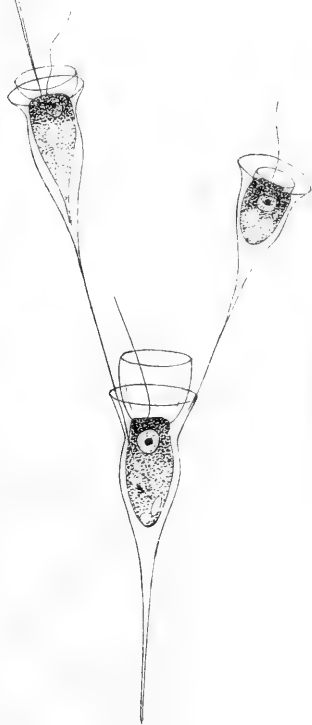
4



3.

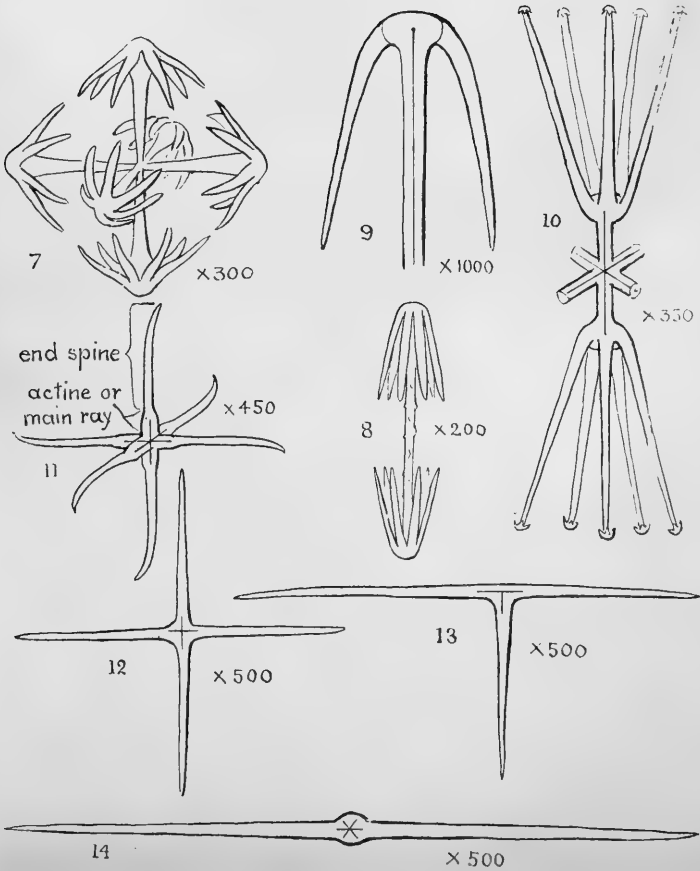
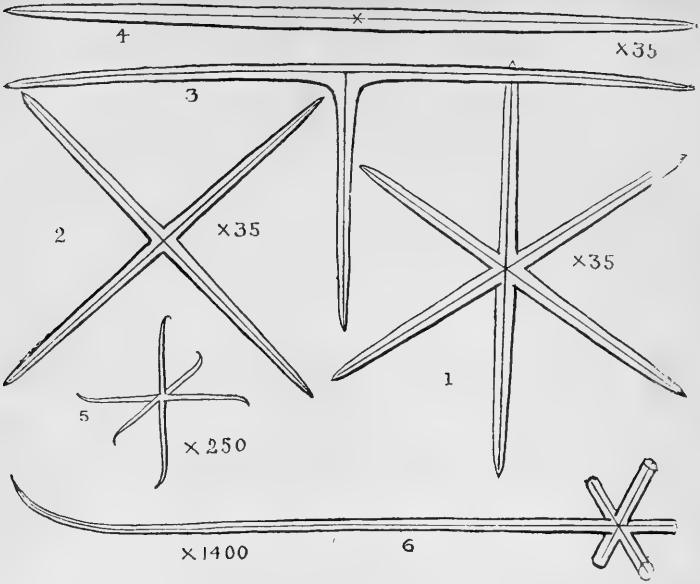


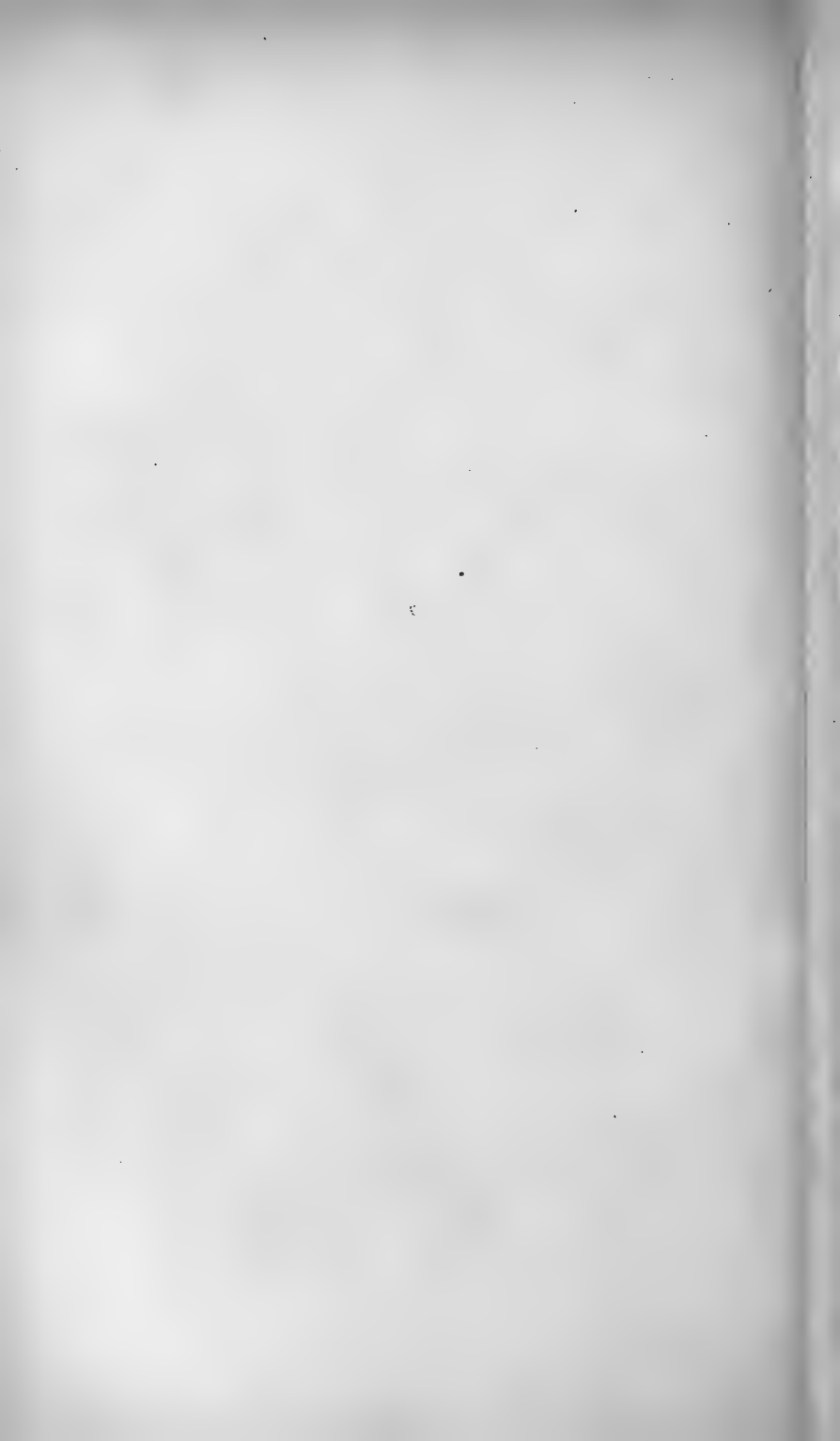
5.

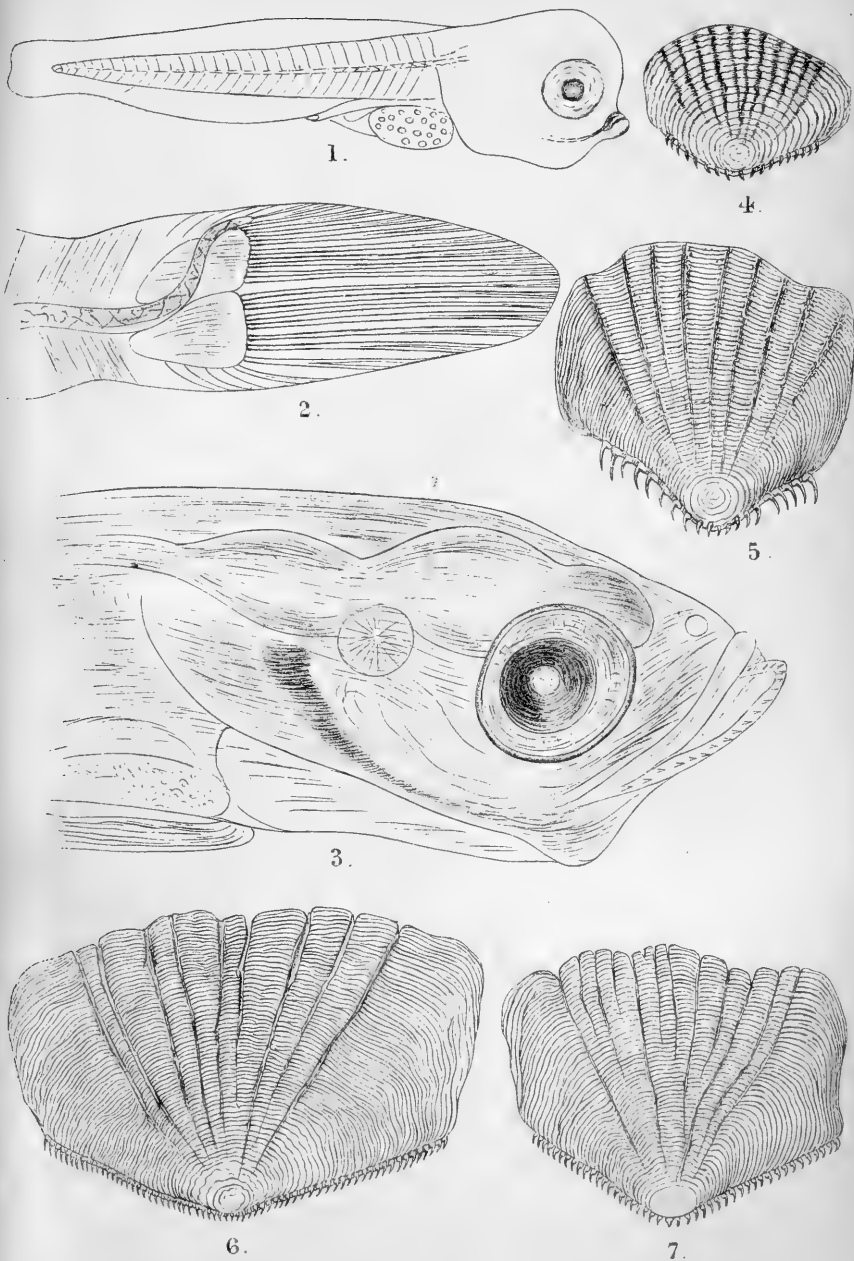


6.





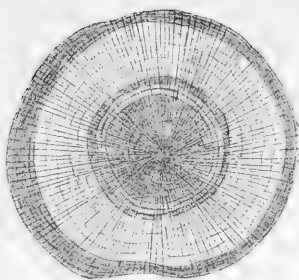




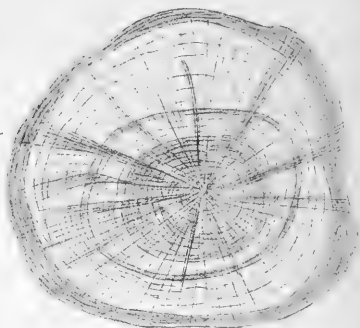




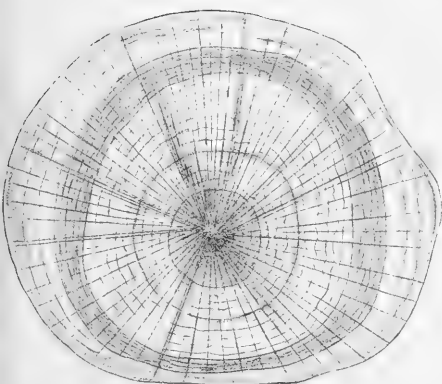
8.



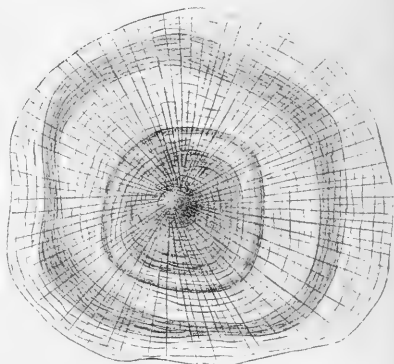
9.



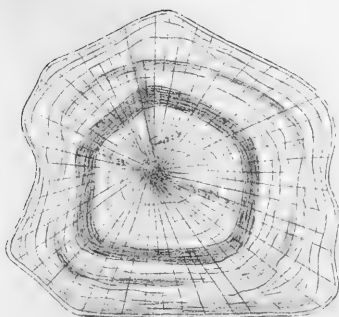
10.



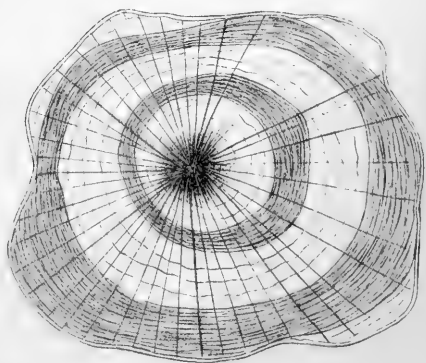
12.



11.



13.



14.



1



2

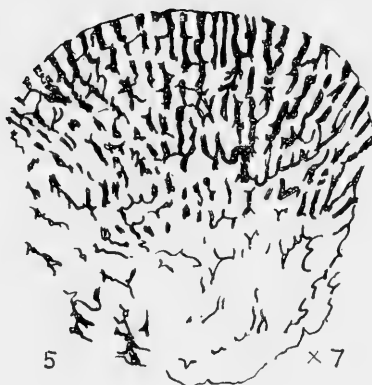


3



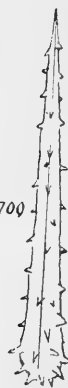
x 700

8



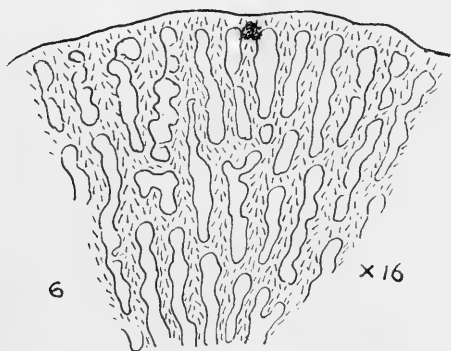
5

x 7



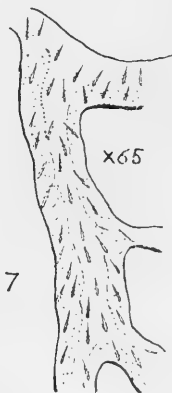
x 700

9



6

x 16



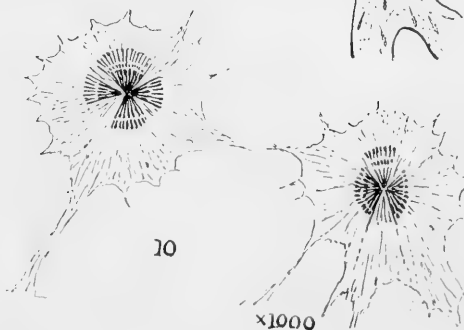
x 65

7



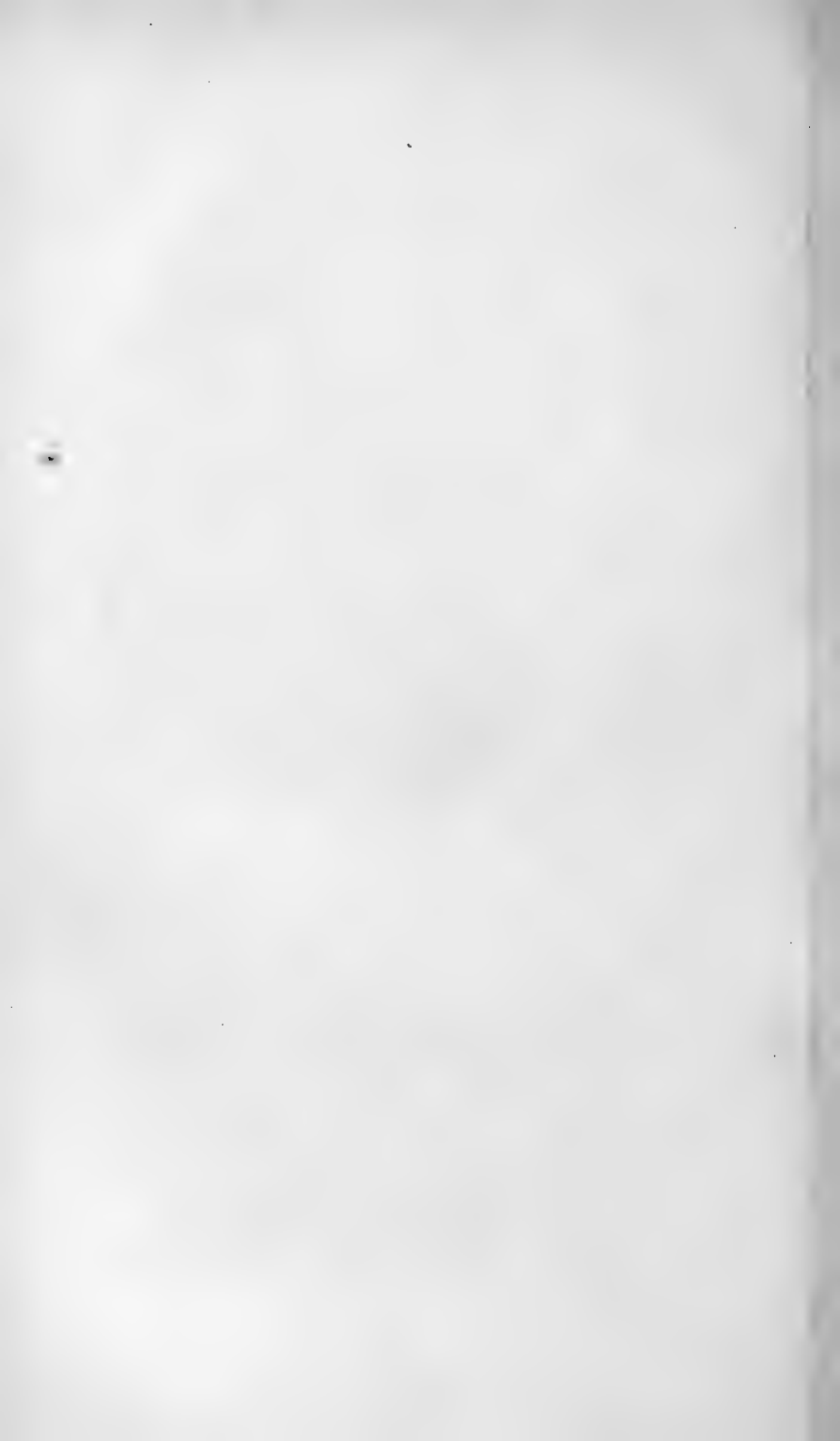
4

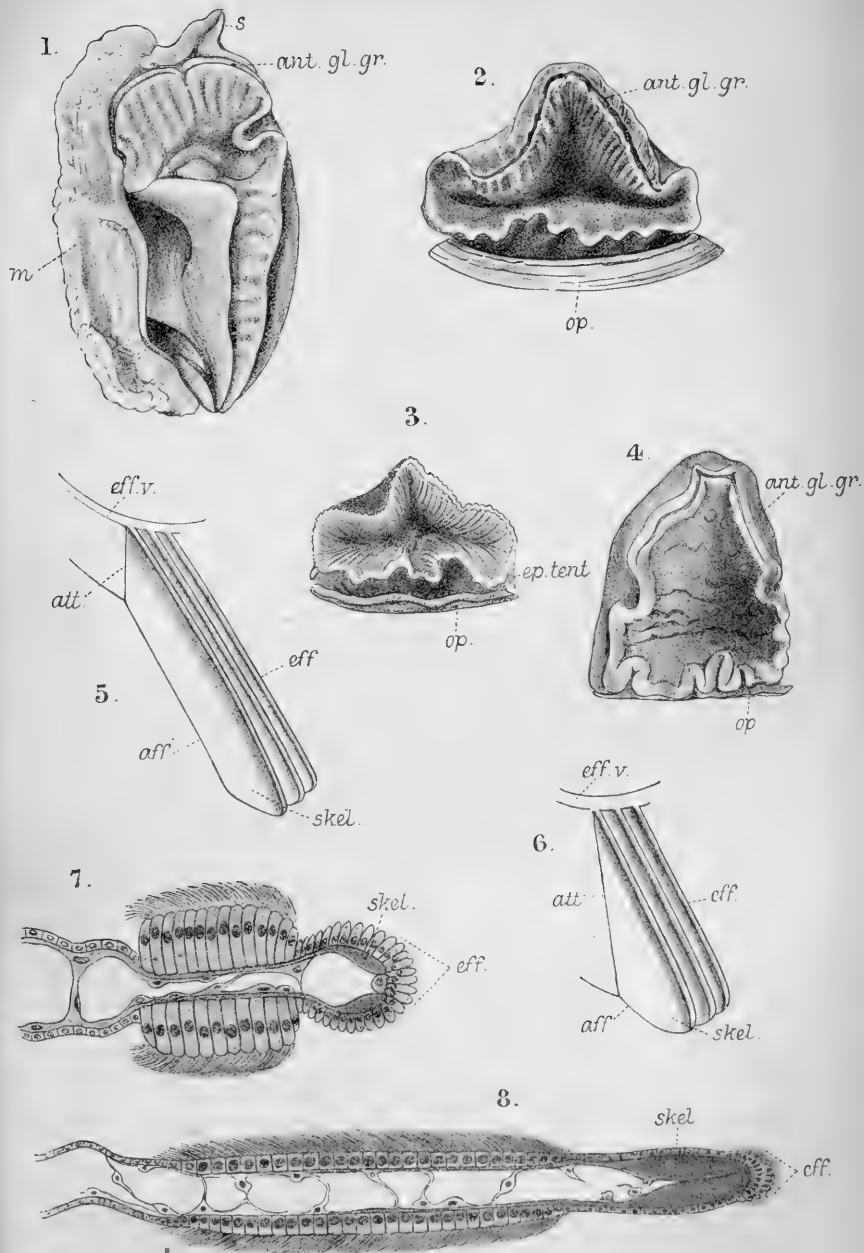
x 10

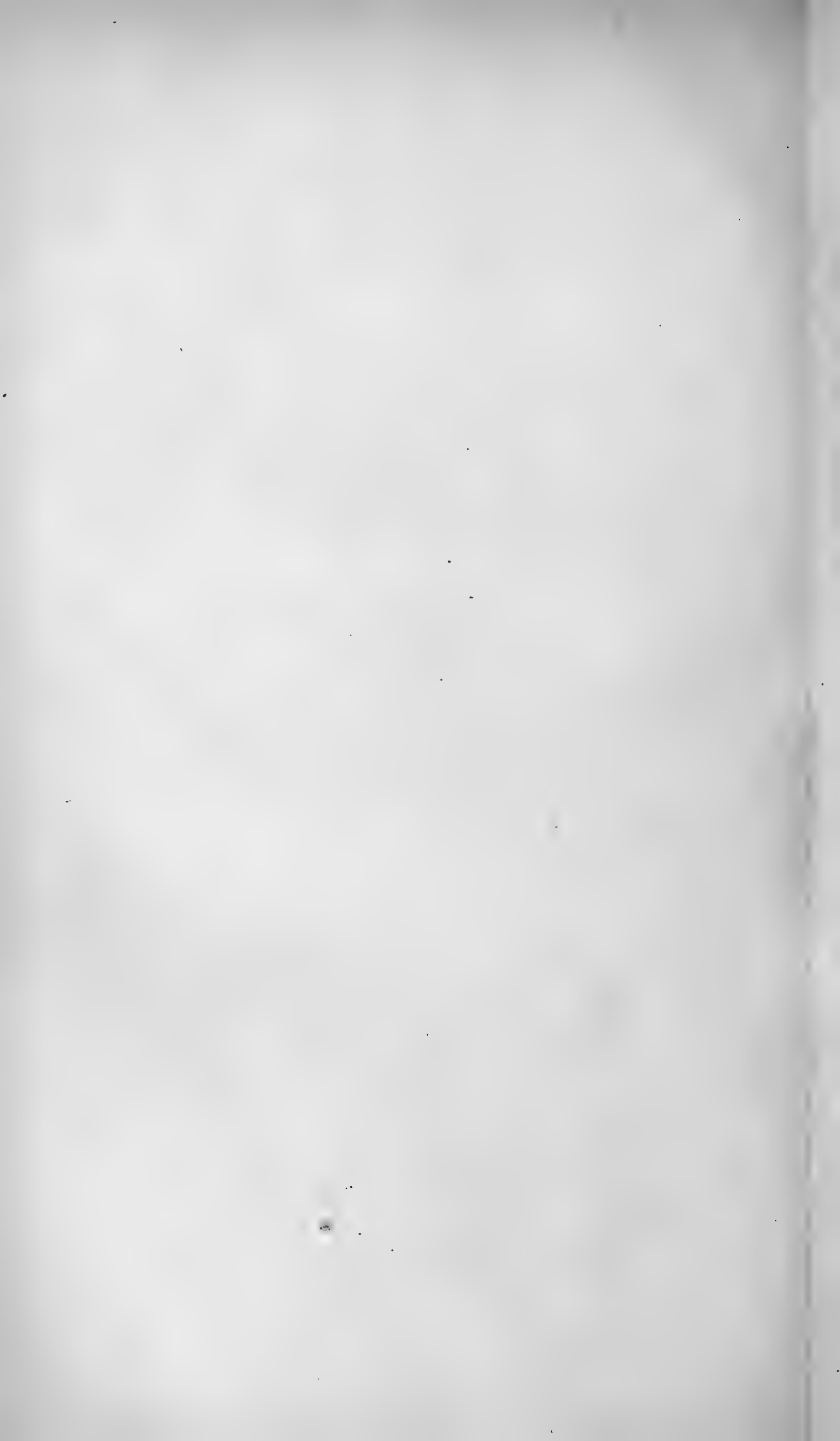


10

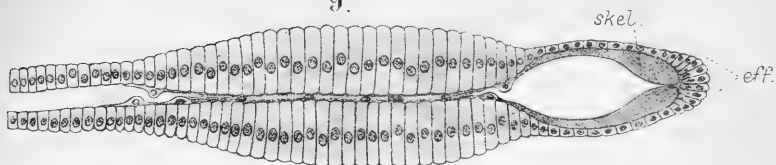
x 1000



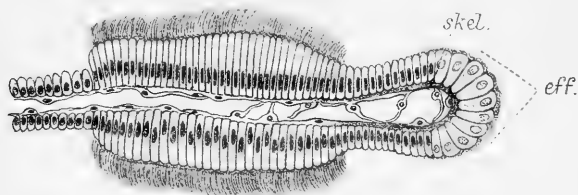




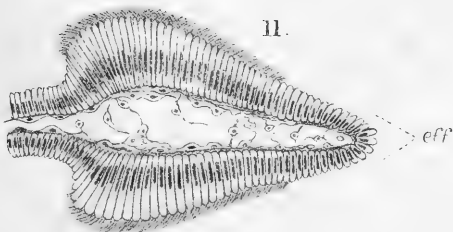
9.



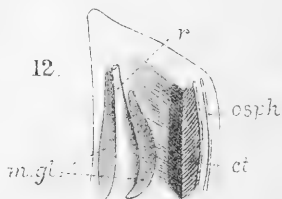
10.



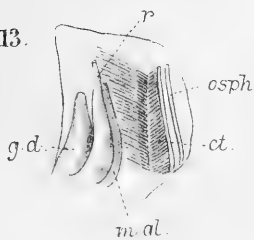
11.



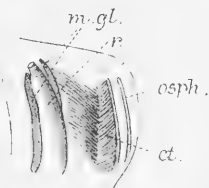
12.



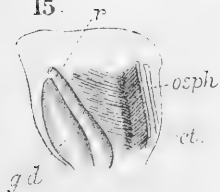
13.



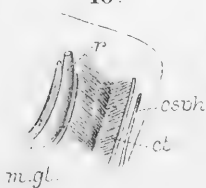
14.



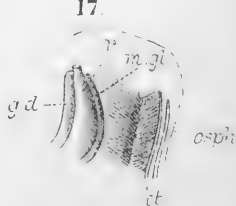
15.

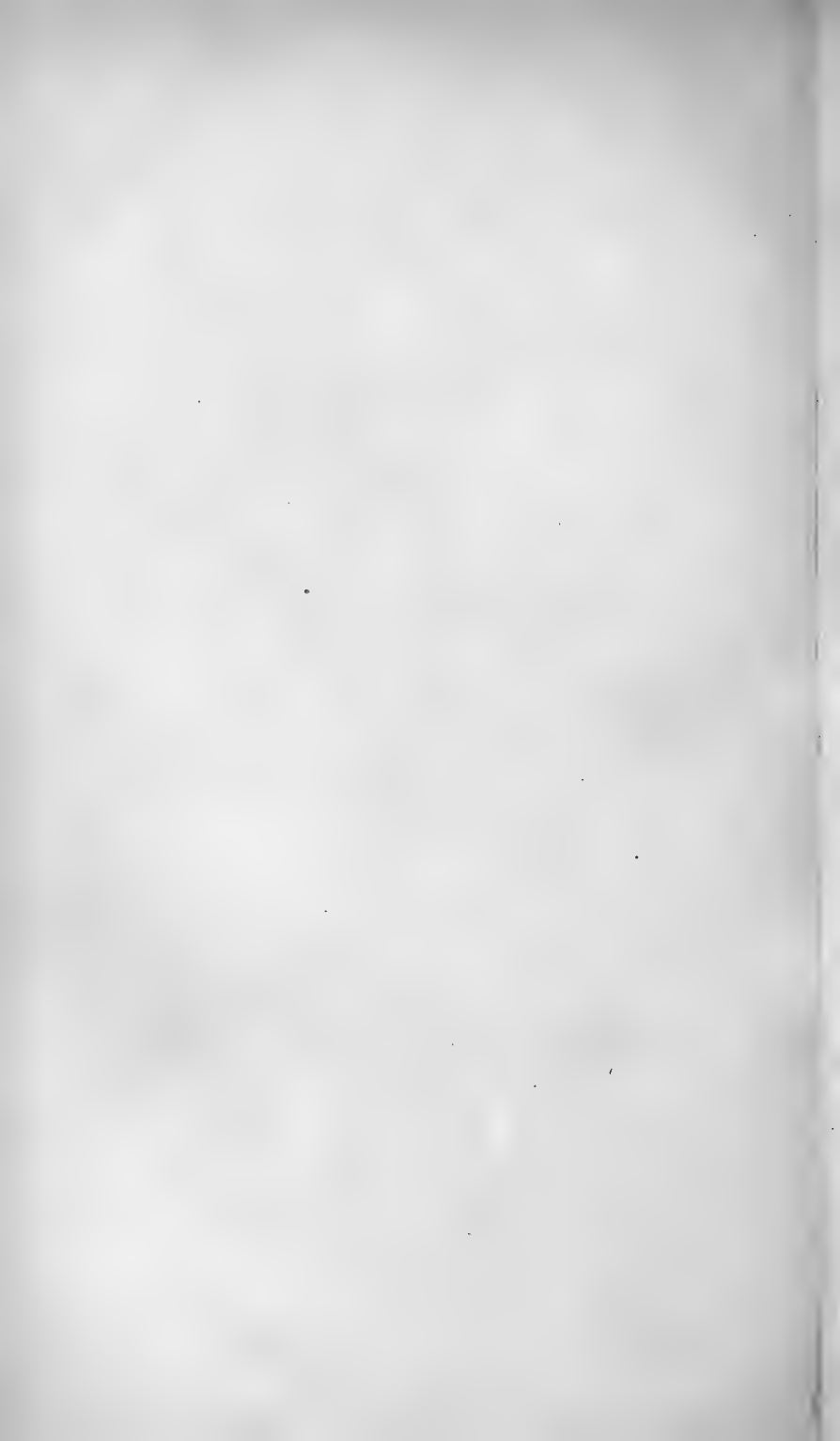


16.



17.





WORKS PUBLISHED BY TAYLOR AND FRANCIS.

- The London, Edinburgh, and Dublin Philosophical Magazine. Monthly. 2s. 6d.
- The Annals and Magazine of Natural History. Monthly. 2s. 6d.
- The Observatory, Monthly Review of Astronomy. 1s.
- Aëronautics, by Brewer and Alexander. 6s.
- Anderson's Fauna of Mergui Archipelago. Vol. I. 30s., Vol. II. 15s.
- Baird's Manual for Tidal Observations. 7s. 6d.
- Blakesley's Table of Hyperbolic Sines and Cosines. 1s.
- Cooke's Flora of the Presidency of Bombay. Vol. I., Part I. 8s., Part II. 9s., Part III. 10s. Vol. II., Part I. 9s., Part II. 9s., Parts III. & IV. 8s. each, Part V. 12s.
- Cunningham's Binary Canon. 15s.
- Denning's Great Meteoric Shower of November. 1s.
- Denning's Telescopic Work for Starlight Evenings. 10s.
- Douse's Introduction to Gothic of Ulfilas. 7s. 6d. net.—Examination of an Old Manuscript, sometimes called The Northumberland Manuscript. 2s. 6d. net.
- Examination Papers set by Examining Board of Physicians and Surgeons. 6d.
- Ditto for Diploma in Public Health. 6d.
- Faraday's Experimental Researches in Chemistry and Physics. 15s.
- Fauna of British India : Mammalia. 20s. — Fishes. 2 vols. 20s. each.—Birds. Vol. I. 20s. Vols. II., III., and IV. 15s. each.—Reptilia and Batrachia. 20s.—Moths. 4 vols. 20s. each.—Hymenoptera. Vol. I.: WASPS AND BEES. 20s. Vol. II.: ANTS AND CUCKOO-WASPS. 20s.—Arachnida. 10s.—Rhynchota. Vols. I.-III. 20s. each. Vol. IV., pts. 1 and 2. 10s. each.—Butterflies. Vols. I. and II. 20s. each.—Coleoptera. Vol. I. 10s.—Coleoptera, CHRYSOMELIDÆ, Vol. I. 20s.—Mollusca. 10s.—Dermaptera. 10s.
- Glaisher's Barometer Tables, 1s. Diurnal Range Tables, 1s. 6d.
- Glaisher's Hygrometrical Tables. 2s. 6d.
- Glaisher's Factor Tables for Fourth, Fifth, and Sixth Millions. 20s. each.
- Godwin-Austen's Land and Freshwater Mollusca of India. Vol. II., Part X. 21s., Part XI. 21s.
- Joule's Scientific Papers. Vol. I. 20s. Vol. II. 12s.
- Kelvin's (Lord) Tables for facilitating Sumner's Method at Sea. 10s. 6d. Forms for ditto. SUN, 1s. STARS, 1s.
- Kirby's Supplement to Diurnal Lepidoptera. 1871-1877. 8s. 6d. net. Lepidoptera Heterocera.—SPHINGES & BOMBYCES. 1892. £2 2s. net. Neuroptera Odonata. 1890. 16s. net.
- Lehfeldt, R. A. A List of chief Memoirs on Physics of Matter. 2s. 6d.
- Lewis's Systematic Catalogue of Histeridæ. 5s. net.—Catalogue of Japanese Coleoptera. 2s. 6d.; on one side, 3s. 6d.
- London Hospital Pathological Catalogue. 7s. 6d. net.
- M'Intosh's Marine Invertebrates and Fishes of St. Andrews. 21s.
- Physical Abstracts. Vols. I. to III. 17s. 6d. each.
- Physical Memoirs, translated from foreign sources. Vol. I., Part I. 4s. Part II. 7s. 6d., Part III. 6s.
- Reade's Origin of Mountain-Ranges. 21s.
- Royal College of Surgeons :
Calendar. 1s. net.
Catalogue of Specimens illustrating the Osteology of Vertebrate Animals in Museum. Part 3. Aves. 12s. net.
Catalogue of Teratological Series. 5s. net.
Dermatological Collection. 3rd ed. 4s. net.
Physiological Series. Vols. I. and II. 2nd ed. 12s. net each.
Appendices 5, 6, 7, 8, and 9 to the Second Edition of Descriptive Catalogue of the Pathological Specimens in Museum. 2s. each.
Examination Papers for Diploma of Fellow and Licence in Dental Surgery. 6d.
- Univ. Coll. London Calendar. 2s. 6d. Pathological Catalogue, Parts 1 to 3, 2s. each; Part 4, 1s. Library Catalogue, 3 Vols. 7s. 6d.
- Univ. Coll. Medical and Biological Catalogue. 2s. 6d.
- Wheatstone's Scientific Papers. 15s.

CONTENTS OF NUMBER 30.—*Eighth Series.*

	Page
LXVI. Descriptions of new African Moths. By Sir GEORGE F. HAMPSON, Bart., F.Z.S., &c.	465
LXVII. Descriptions and Records of Bees.—XXIX. By T. D. A. COCKERELL, University of Colorado	496
LXVIII. Descriptions of a new Hawk-Moth and some new <i>Syn- tomidae</i> . By the Hon. WALTER ROTHSCHILD, Ph.D.	506
LXIX. Descriptions of Four new African Snakes in the British Museum. By G. A. BOULENGER, F.R.S.	512
LXX. Notes on the Gastropod Foot and Branchial Cavity. By HILDA M. BISHOP, University College of Wales, Aberystwyth. (Plates XII. & XIII.)	513
LXXI. Note on Two Species of the Genus <i>Pandalus</i> . By W. T. CALMAN, D.Sc.	524
LXXII. On <i>Cercocobus aterrimus</i> and <i>Cercocobus albigena</i> . By ERNST SCHWARZ	527
LXXIII. On the Caudal Fin of the <i>Clupeidae</i> , and on the Teleostean Urostyle. By C. TATE REGAN, M.A.	531
LXXIV. Three new Asiatic Mammals. By OLDFIELD THOMAS ..	534

BIBLIOGRAPHICAL NOTICE.

Catalogue of the Lepidoptera Phalænæ in the British Museum.	
Vol. IX. Catalogue of the <i>Noctuidæ</i> in the Collection of the British Museum. By Sir GEORGE F. HAMPSON, Bart.	536

PROCEEDINGS OF LEARNED SOCIETIES.

Geological Society	537, 538
Index	539

*** It is requested that all Communications for this Work may be addressed, post-paid, to the Care of Messrs. Taylor and Francis, Printing Office, Red Lion Court, Fleet Street, London.

